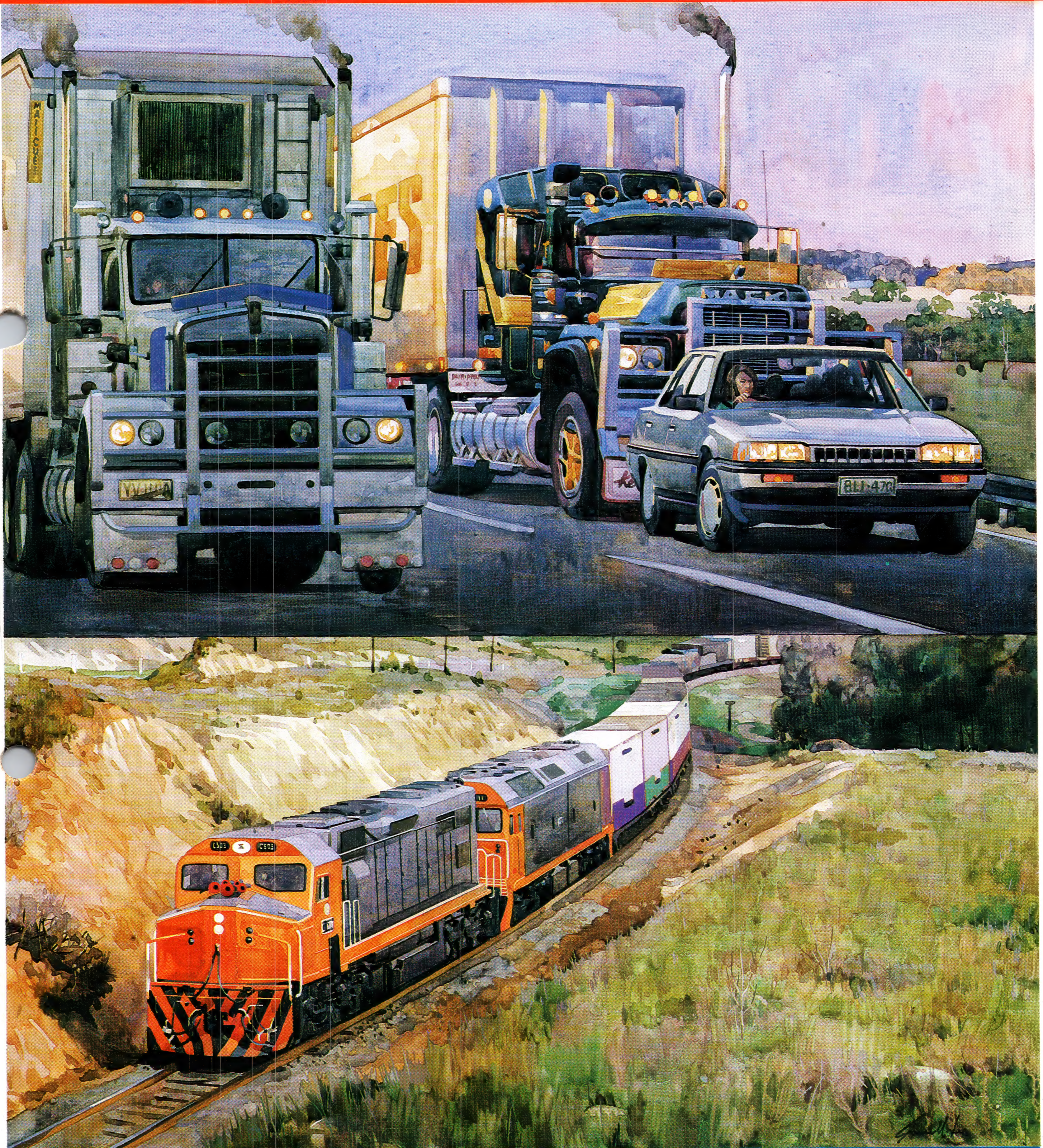
Vol. 26 No. 3 July, August, September 1989

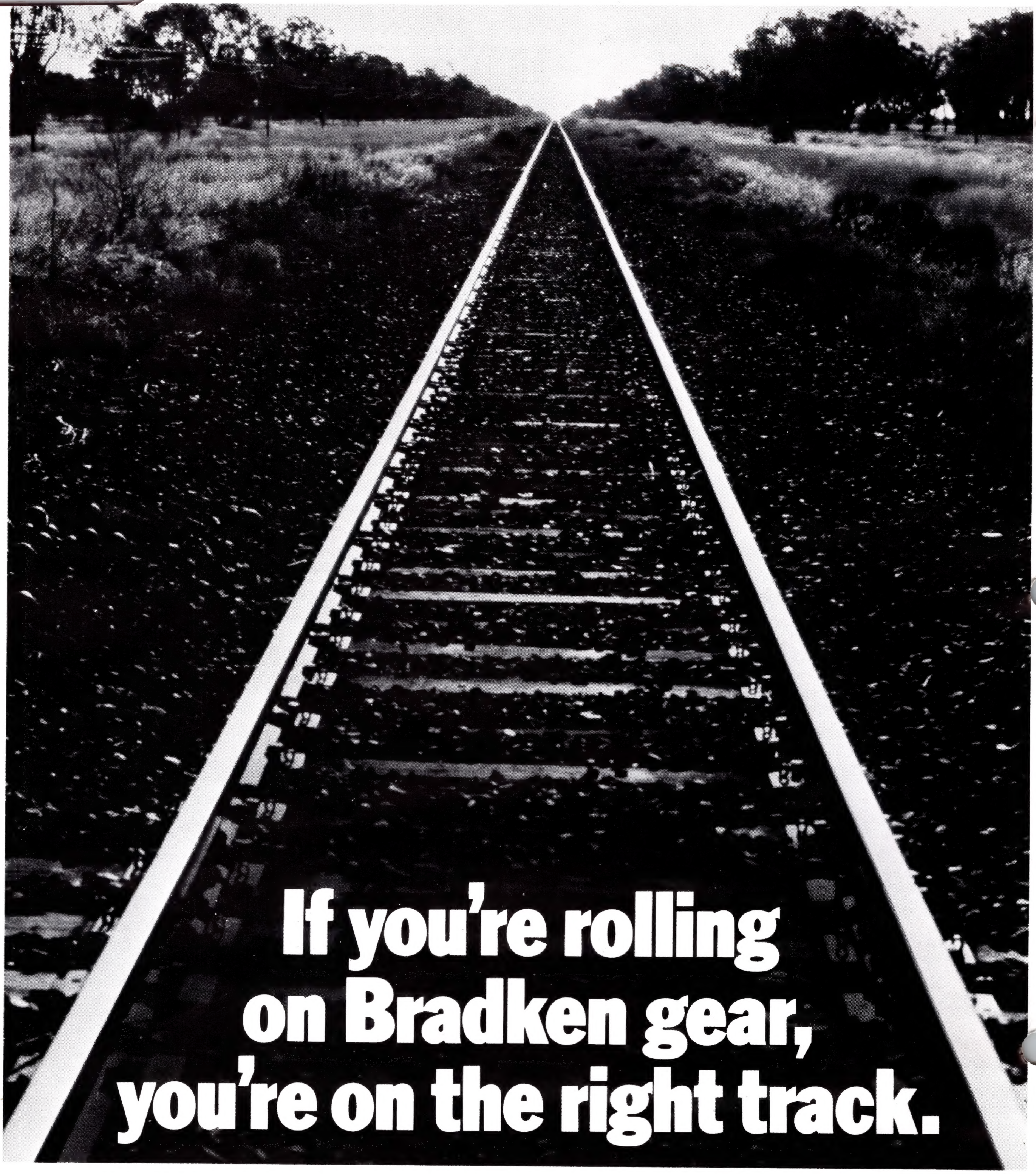
NETWORK

THE RAILWAYS OF AUSTRALIA QUARTERLY



ROAD COST RECOVERY

The case for road transport paying its fair share



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NETWORK
THE RAILWAYS OF AUSTRALIA QUARTERLY

THE EXECUTIVE DIRECTOR'S COLUMN

Vital to Australia's export trade is the efficient movement of minerals from mines to ports.

Australia's rail systems have, of course, a very important role in this task, which in railway terminology is categorised as one of "heavy haul".

It is particularly pleasing then that in September, Australia will be host to railway engineers and operating staff from all over the world for the Fourth International Heavy Haul Railway Conference to be held in Brisbane. Delegates will exchange experience and knowledge derived from their work in the movement of bulk commodities by rail.

With much of the initiative coming from Australia, the first IHH conference was held in Perth in 1978. Consider what has happened in our country since then.

At that time, the shining examples of heavy-haul operation were to be found in the Pilbara region of north-west Western Australia. There, four privately-owned railways, built specially for the task, move millions of tonnes of iron ore from our rugged interior to the coast.

But in the last decade, Australia's government railways have developed rapidly. They now use sophisticated heavy-haul techniques, many of which originated overseas but which have been developed, improved and adapted in Australia. IHH conferences have assisted a two-way flow of information.

Today we can point to the growth of export coal in the Hunter Valley region of New South Wales, with its regular trains of 8,400 tonnes moving to two new coal export loading sites. In Queensland, trains carrying 10,500 tonnes of coal and operating on 1067mm gauge tracks employ "locotrol" units to facilitate delivery of power throughout the length of trains. Indeed, the prime example in Australia of using new technology to cope with an expanding task s the electrification of Queensland's vast coal-hauling railways, now almost complete.

It is therefore appropriate that Queensland Railways should be closely associated with the organisation of the IHHA conference and act as host rail system.

The papers to be presented in September obviously concentrate on heavy haul operations — the movement of bulk commodities such as iron ore and coal in unit train loads. But the lessons learned from this type of operation rub off on all aspects of railways. Such topics as locomotive characteristics and design and rollingstock for use in heavy container train operation will also be discussed.

Important papers will be presented from the Peoples' Republic of China and from the Indian Railways, both developing skills in this area, as well as from the experienced heavy-haul countries such as the US and Canada.

The IHHA sought the help of the Institution of Engineers, Australia, to administer the conference. But much of the hard work of session organisation and the planning for conference tours has rested with senior engineers of the Queensland Railways.

The delegate list is starting to look impressive. The Railways of Australia will be watching the proceedings with interest.

M.C.G. SCHRADER

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- *State Rail Authority of New South Wales*
- *Public Transport Corporation – Victoria (V/Line & THE MET)*
- *Western Australian Government Railways (Westrail)*

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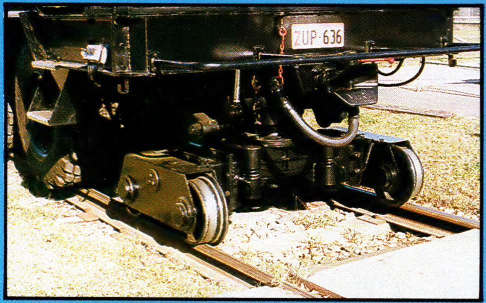
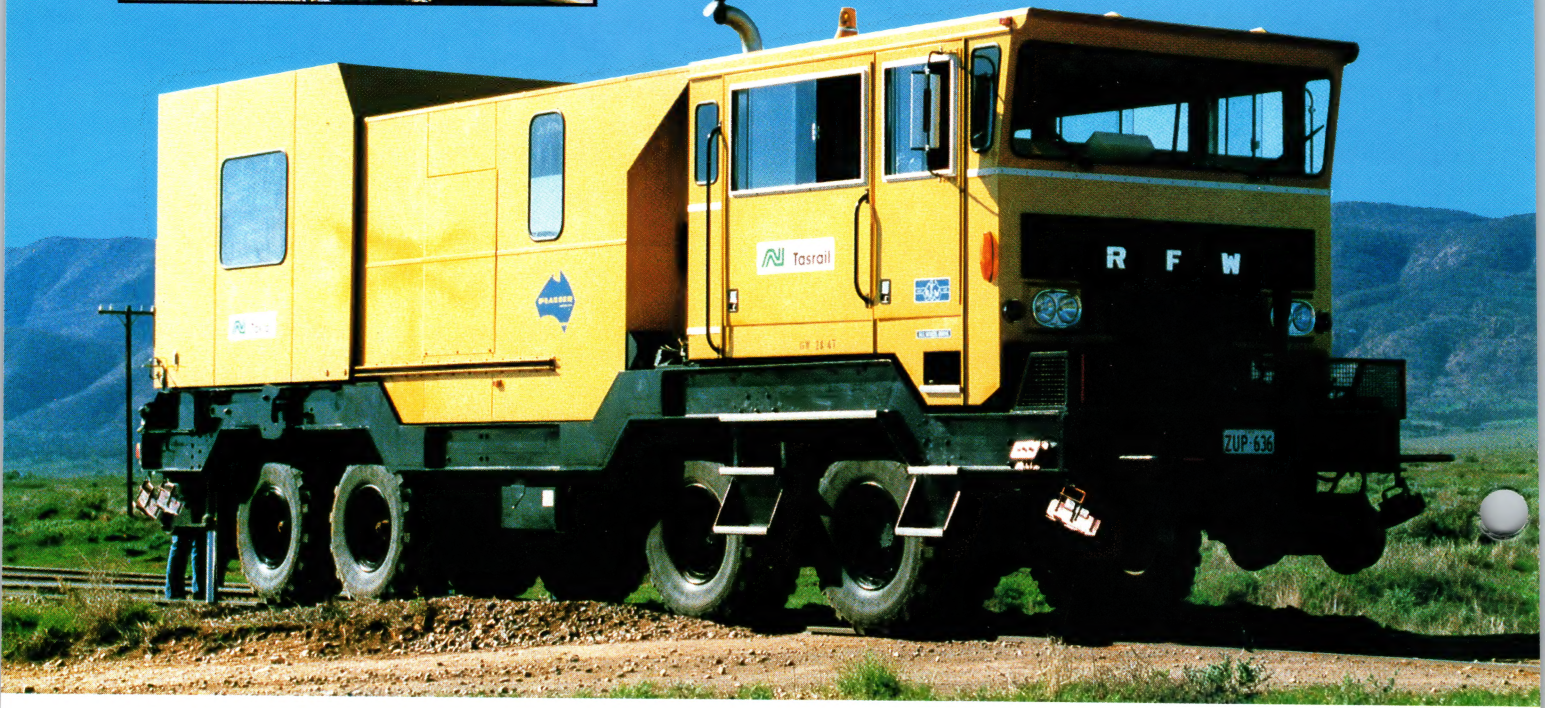


On road, on rail, weld done!



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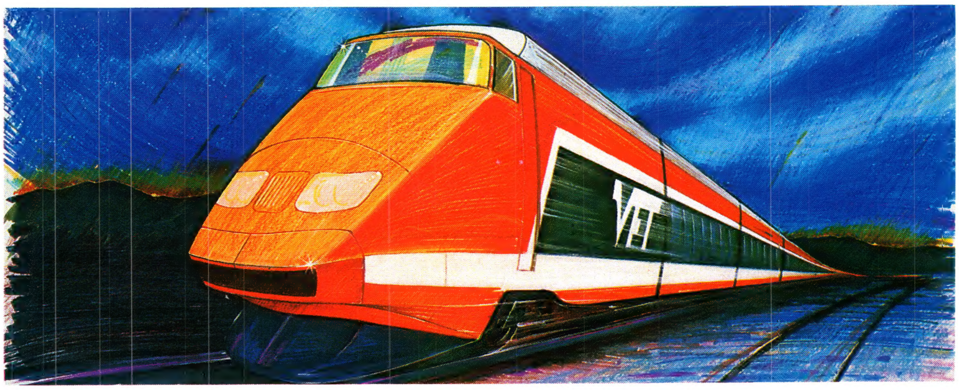

A compelling vision: artist's impression of the proposed Very Fast Train.

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EXECUTIVE DIRECTOR'S COLUMN 3
WINDOWSEAT 58

$2B UPGRAD

CityRail's massive revamp is aiming to make the service equal to the best in the world by the mid-1990s.

Two billion dollars will be spent over five years to upgrade Sydney's commuter train services, the New South Wales Transport Minister, Bruce Baird, has announced.

Mr Baird said the NSW government's commitment to the massive program was in response to State Rail board recommendations arising from the Booz Allen and Hamilton report into CityRail. State Rail Chief Executive Ross Sayers commissioned the report last year.

The new program will begin with spending $300 million on capital works in 1989/90 and is designed to make Sydney's CityRail service equal to the best in the world.

"The government will support proposals contained in the report, many of which were already being carried out by State Rail," Mr Baird said.

"The time frame for implementation of the program will depend on the availability of government funds, but we anticipate completing the work in five to six years."

The Booz Allen and Hamilton report confirms criticisms that the Sydney system is badly rundown.

Releasing it, Mr Sayers said he was honoring the commitment to make its full findings public.

"CityRail provides services to 240 million passengers a year, and they have a right to know the facts of the business, and what is being done to improve the quality of service," Mr Sayers said.

"The Sydney system is a large urban network by world standards, but at the present we fall short of comparable overseas systems."

Proposals in the Booz Allen and Hamilton report were being acted on immediately, the CityRail Group General Manager, Rob Schwarzer, said. He presented a plan for CityRail's new direction with the broad aims of increasing the safety and quality of service, increasing productivity and effectiveness, and improving financial performance.

The plan sets out details of the improvements needed. These include:

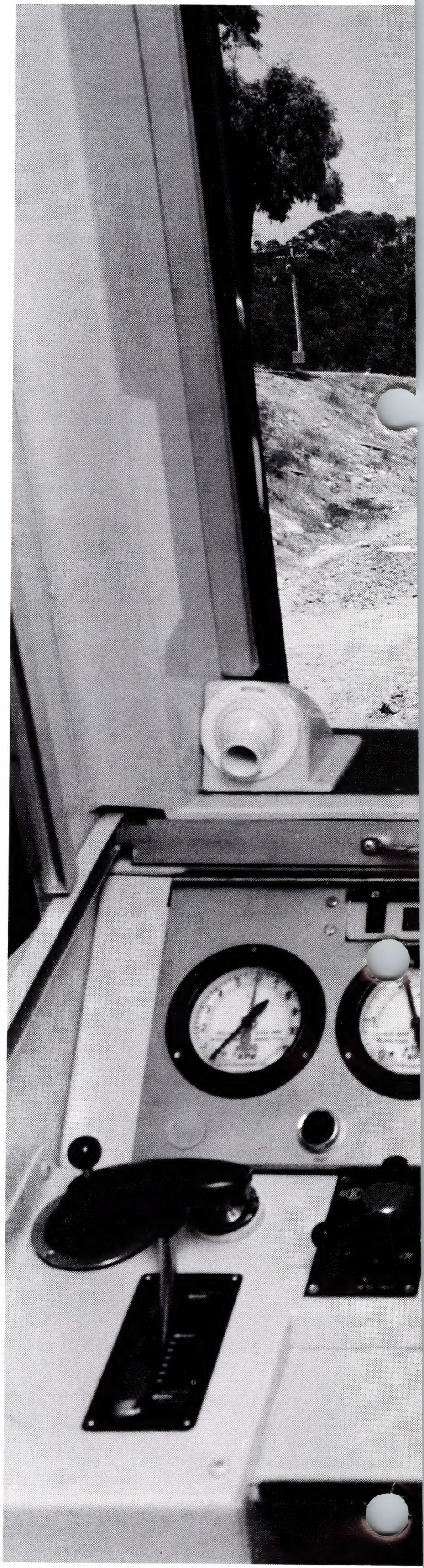
- Major refurbishment of more than 250 stations.
- A crackdown on graffiti and vandalism, and faster removal of graffiti at stations and on trains.
- Tangaras to replace all "red rattlers" and double-decker suburban cars to be renovated by 1995.

Mr Schwarzer said many of the major works would be on the essential maintenance of the network.

"For example, we will spend more than $400 million on signalling replacement," he said.

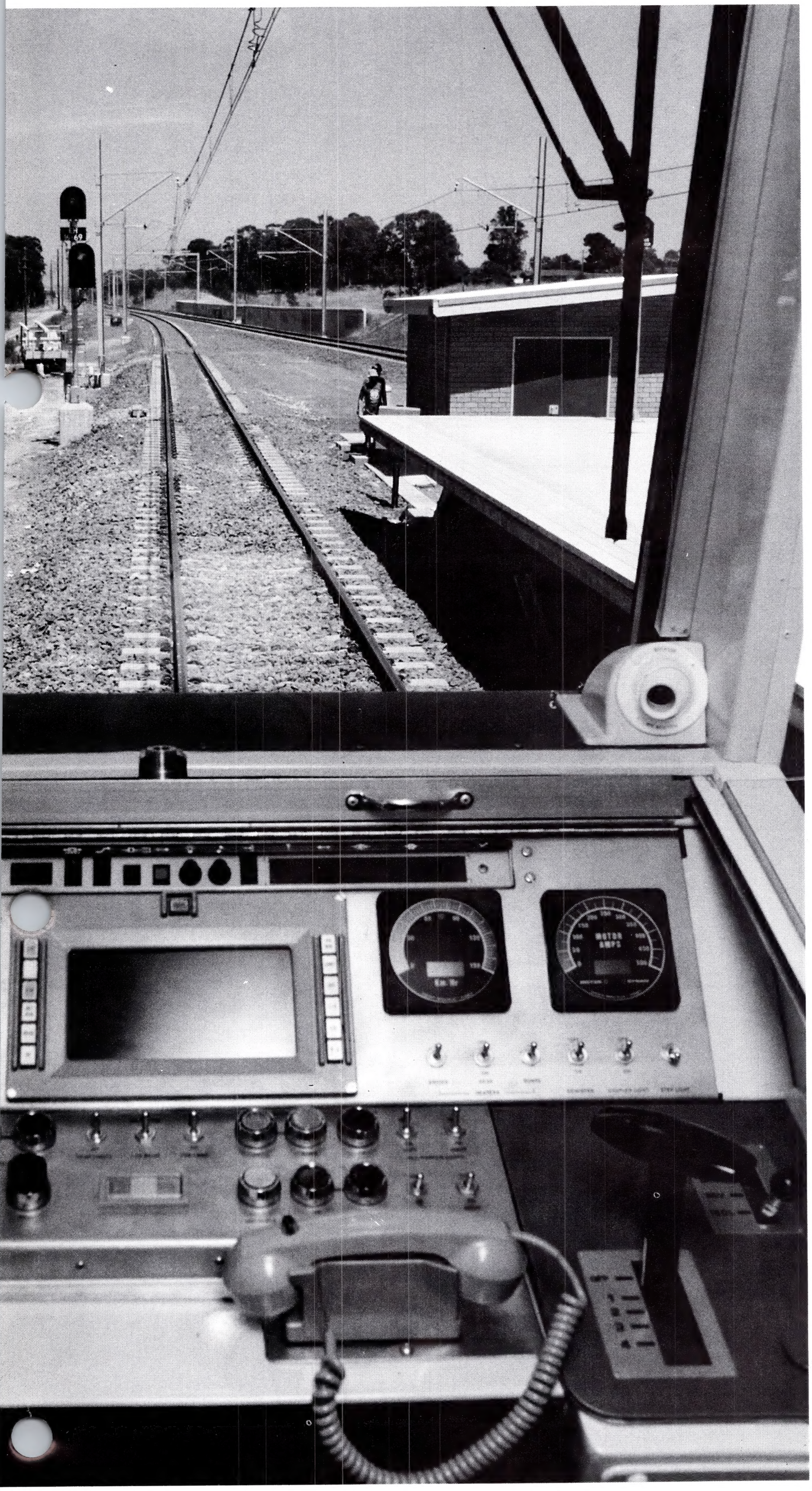
"These will include signals, cables and signal box and control replacements to provide greater reliability and better information direct to station platforms, updating the 50-year-old system."

Other measures would be to accelerate concrete sleepering, to improve track, embankment



Driver's view from State Rail's Tangara: They will replace all Red Rattlers on Sydney's CityRail system by 1995.

FOR SYDNEY



stabilisation to improve track reliability, bridge replacement, and overhead power supply enhancement to meet the demands of Tangara and heavy freight train loadings. High priority has also been given to passenger security.

The new program aims to eradicate inefficient work and management practices that have in the past come under fire from the media and government. Absenteeism, injuries, restrictive awards or local practices, and inefficient systems and equipment leading to overmanning will be the targets of the CityRail action plan.

Mr Schwarzer said new technology would be widely used to support the improvement program. Any staff reductions within CityRail would follow the State Rail policy of having no forced redundancies.

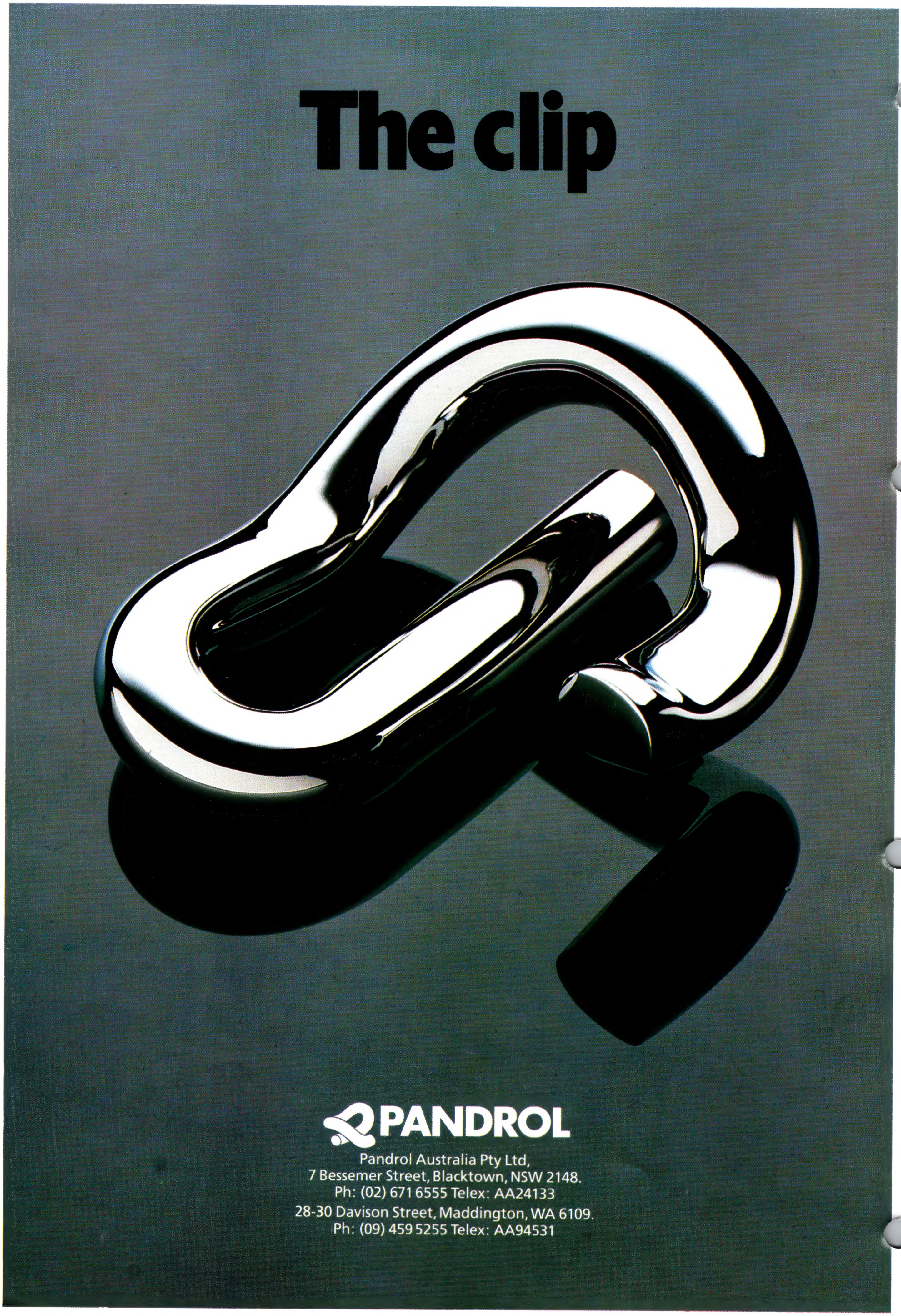
"Redeployment and retraining will be offered to displaced employees," he said. "Other reductions will be achieved by natural attrition, but we will ensure staff levels are consistent with need."

While the consultants had recommended an increase in fares, this was a matter for the government, Mr Schwarzer said.

Measures to increase revenue will include:

- Reducing fare evasion, now estimated to cost between $30 and $50 million a year.
- Introducing automatic fare collection systems from 1991 at a cost of $50 million.
- Improving the profitability of CityRail retail outlets.
- Revising outdoor advertising pricing and marketing policies.
- Encouraging greater commercial development at stations.

"Our new plan, following Booz Allen and Hamilton recommendations, will give Sydney travellers a world-class system by the mid-1990s," Mr Schwarzer said.



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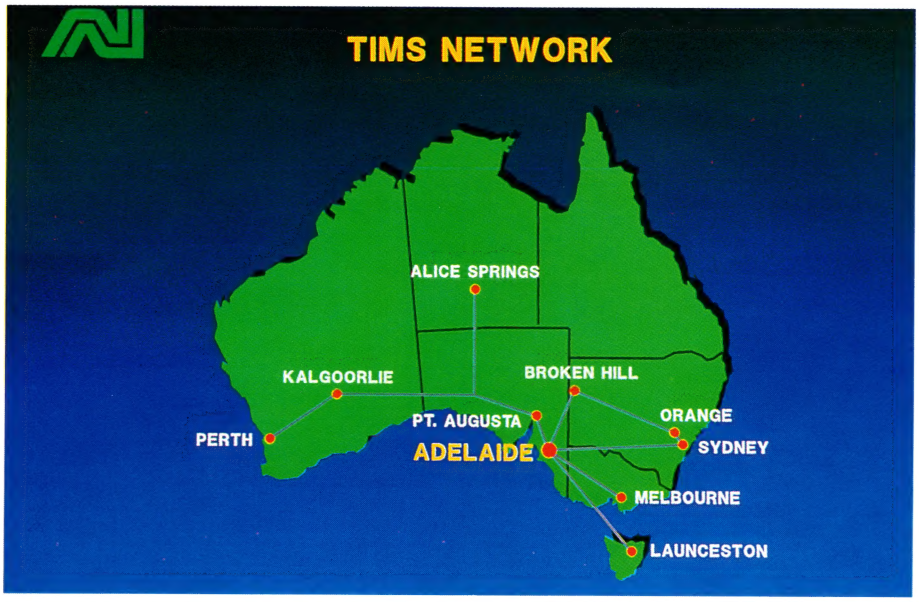
TIMS

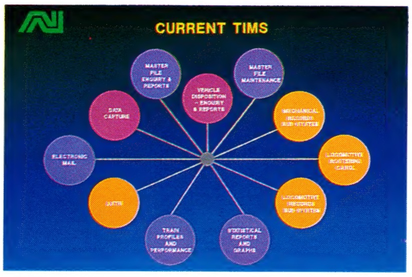
The computer revolution is leaving nothing unchanged. **Australian National** is harnessing the technology to help it win more freight customers through greater efficiency.

Australian National has introduced computer technology into a number of areas as part of its drive to become more efficient and therefore more competitive in the freight transport market.

One of those innovations is the Traffic Information Management System (TIMS). It is used to monitor and control an ROA fleet of 22,000 wagons and 260 locomotives that make up about 180 trains a day running on AN territory.

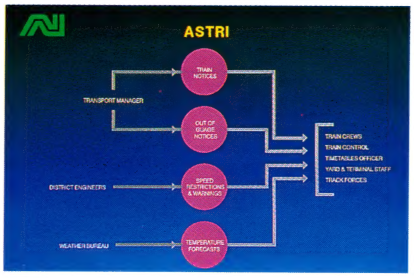
TIMS has enabled AN to provide better service to customers: train reliability has





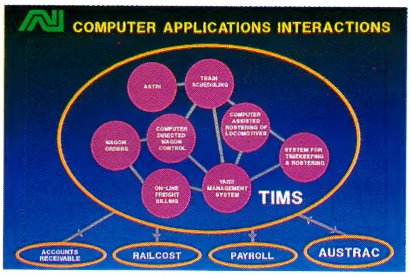
CURRENT TIMS

MASTER FILE ENQUIRY & REPORTS
MASTER FILE MAINTENANCE
VEHICLE DISPOSITION – ENQUIRY & REPORTS
DATA CAPTURE
MECHANICAL RECORDS SUB-SYSTEM
ELECTRONIC MAIL
LOCOMOTIVE ROSTERING CAROL
ASTRI
LOCOMOTIVE RECORDS SUB-SYSTEM
TRAIN PROFILES AND PERFORMANCE
STATISTICAL REPORTS AND GRAPHS



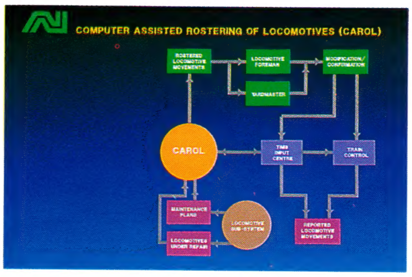
ASTRI

TRANSPORT MANAGER
DISTRICT ENGINEERS
WEATHER BUREAU
TRAIN NOTICES
OUT OF GUAGE NOTICES
SPEED RESTRICTIONS & WARNINGS
TEMPERATURE FORECASTS
TRAIN CREWS
TRAIN CONTROL
TIMETABLES OFFICER
YARD & TERMINAL STAFF
TRACK FORCES



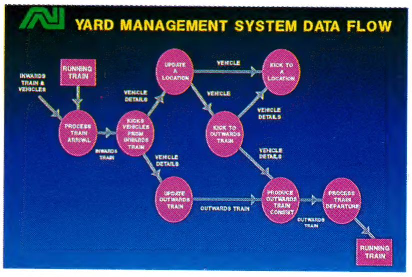
COMPUTER APPLICATIONS INTERACTIONS

ASTRI
TRAIN SCHEDULING
COMPUTER ASSISTED ROSTERING OF LOCOMOTIVES
WAGON ORDERS
COMPUTER DIRECTED WAGON CONTROL
SYSTEM FOR TIMEKEEPING & ROSTERING
ON-LINE FREIGHT BILLING
YARD MANAGEMENT SYSTEM
TIMS
ACCOUNTS RECEIVABLE
RAILCOST
PAYROLL
AUSTRAC



COMPUTER ASSISTED ROSTERING OF LOCOMOTIVES (CAROL)

ROSTERED LOCOMOTIVE MOVEMENTS
LOCOMOTIVE FOREMAN
MODIFICATION/ CONFIRMATION
YARDMASTER
CAROL
TIMS INPUT CENTRE
TRAIN CONTROL
MAINTENANCE PLANS
LOCOMOTIVE SUB-SYSTEM
LOCOMOTIVES UNDER REPAIR
REPORTED LOCOMOTIVE MOVEMENTS



YARD MANAGEMENT SYSTEM DATA FLOW

INWARDS TRAIN & VEHICLES
RUNNING TRAIN
PROCESS TRAIN ARRIVAL
INWARDS TRAIN
KICKS VEHICLES FROM INWARDS TRAIN
VEHICLE DETAILS
UPDATE A LOCATION
VEHICLE
KICK TO A LOCATION
VEHICLE
VEHICLE DETAILS
KICK TO OUTWARDS TRAIN
VEHICLE DETAILS
VEHICLE DETAILS
UPDATE OUTWARDS TRAIN
OUTWARDS TRAIN
PRODUCE OUTWARDS TRAIN CONSIST
OUTWARDS TRAIN
PROCESS TRAIN DEPARTURE
RUNNING TRAIN

TIMS can be used to produce a variety of statistical graphs.

Production of paying freight shows net tonne kilometres, a measure of the freight work done by a railway, between 1986 and 1988, budgeted NTKs and a 12-period moving average to show the trend of the increase.

improved and customer inquiries can be answered immediately. Costs have been reduced, and less rollingstock is needed because it is being used more efficiently. TIMS has also replaced many manual and clerical procedures.

In 1980, AN decided to develop a computerised wagon monitoring system. A number of systems were investigated but most of them would either have needed large-scale modification to suit AN's requirements or would have been too costly, complicated or difficult to support. AN therefore decided to develop its own system, tailored to the needs of AN and its customers.

The initial intention was for a wagon monitoring system only, but by mid-1984 it had become obvious that AN needed a real-time train monitoring system that could give instant information about train performance. A pilot scheme was developed and introduced in early 1985 and was integrated later that year with the wagon monitoring system to provide the nucleus of the Traffic Information Management System (TIMS). The production version of TIMS came on line in January 1986.

TIMS consists of a network of computer terminals linked to a central processing unit that contains information such as:

- Current and planned movements.
- Which trains are running.
- How many wagons are on each train, their weights, destinations and contents.
- Which locomotives are being used.
- The progress of trains, whether they are running on time, and if not, why not.
- Which wagons and locomotives need repairs, planned or unplanned.
- What the condition of the track is and where there are speed restrictions.
- Where dangerous goods are located on trains.

Marshalling yard staff write down information about trains on forms,

The loaded wagon kilometre graph provides a comparison of the productivity of wagon groups. The wagon fleet has been divided into groups according to the commodities they carry.

The third graph shows the availability of AN's locomotive fleet.

which are sent by facsimile to TIMS staff for keying into the system. The information is then available within minutes to authorised people throughout AN's network.

Although train controllers are the most obvious users of TIMS, its data is invaluable to yard and terminal managers, movement planners, marketing and senior operations management staff.

The introduction of TIMS has brought improvements in several areas.

About 30 per cent more freight trains and 12 per cent more passenger trains have arrived on time.

AN's customers are receiving better service not only because trains are running on schedule but because of the quick response to their inquiries. Before TIMS, some requests for information could take 24 hours to service. Now they can be answered in minutes.

TIMS has been partly responsible for a reduction of more than 30 per cent in the wagon fleet.

Little-used wagons can be identified and either scrapped or mothballed.

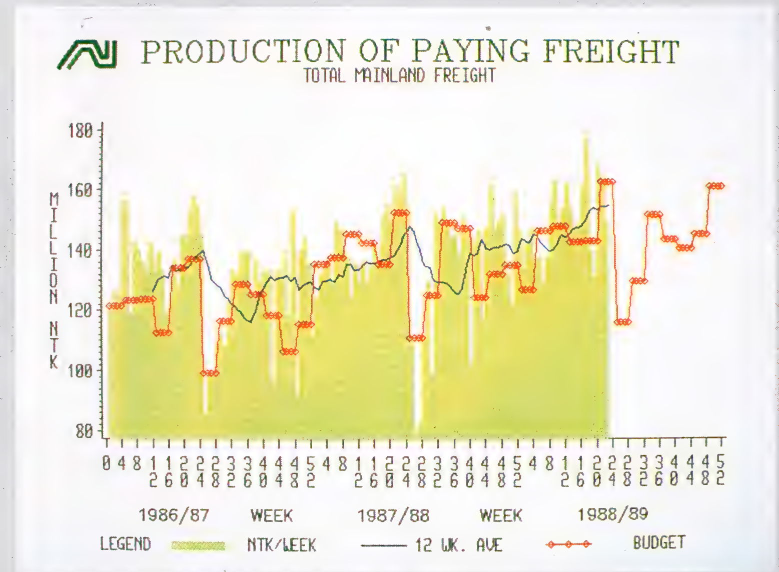
TIMS has replaced a large number of train detail forms with a few standard documents. This has simplified staff training and increased accuracy.

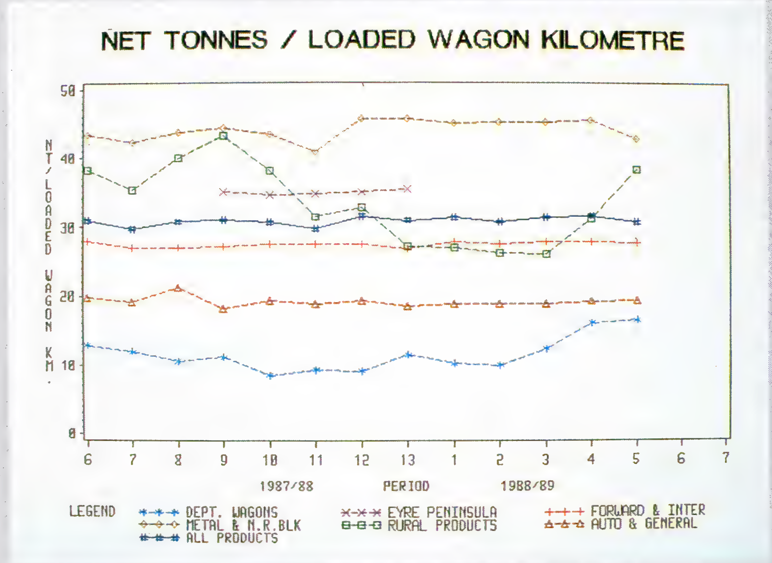
Reports on the up-to-date rollingstock inventory are now available on demand.

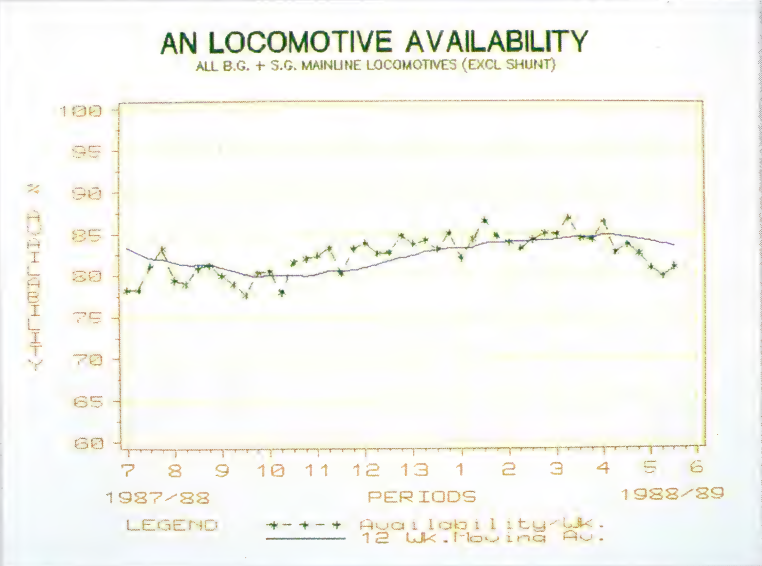
There have been a number of developments and extensions to TIMS, including the locomotive records sub-system, computer assisted rostering of locomotives, and the advice system for train running information.

The locomotive records sub-system, implemented in February 1987, shows when routine servicing locomotives is due.

Staff can also plan the intake of vehicles into depots on a priority basis and signal when serviced locomotives are ready for return to traffic.







ANOTHER DEVELOPMENT BEING EXAMINED IS TO PROVIDE CUSTOMERS WITH DIRECT ACCESS TO DATE WITH FULL SECURITY. ON-LINE FACILITIES WILL ENABLE CUSTOMERS TO MONITOR THE PROGRESS OF THEIR CONSIGNMENTS, RESERVE TRAIN SLOTS, AND ORDER EMPTY WAGONS FOR LOADING.

Computer-assisted rostering of locomotives (CAROL) provides clerical assistance and allocates the most suitable locomotives available to train services, matching locomotives to specific workloads.

The advice system for train running information (ASTRI) is an electronic mailing system. Locomotive drivers and train controllers can get advice abut speed restrictions on the track almost as soon as they have been imposed or removed by track maintenance.

Several other developments are either underway or planned.

The yard management system should be in use by mid-1989. It will provide information such as the location of wagons within a yard, which wagons need to be shunted where and when, how specific trains are to be marshalled, and the productivity of each shift.

In addition to operational benefits, TIMS can provide useful management and statistical information.

Graphs can be produced using TIMS information to show production of paying freight, a comparison of the productivity of different wagons groups according to the commodities they carry, and locomotive availability.

Several further developments are now underway, including the system for timekeeping and rostering, expert rostering of locomotives, and provision of direct customer access.

The system for timekeeping and rostering (STAR) assigns crews to train services, reducing clerical effort in rostering, timekeeping and drawing up payrolls. Rostering is far more efficient and non-productive staff time is minimised. The rostering is fair and errors are minimal.

Another exciting new development is the application to railways of artificial intelligence, also called knowledge-based systems technology. Expert rostering of locomotives (EROL) has been chosen as a pilot project and is being developed in a joint venture with Fujitsu Australia. The computer will roster the locomotives, freeing the person who normally does the job to investigate problem areas and find ways of increasing productive use of the locomotive fleet. Eventually, EROL will ensure that all trains have the right locomotive power rostered for the service requirements and for the track.

AN is looking at better ways of obtaining the basic data. The people who manually record train details can make mistakes, and these mistakes can be keyed into the system with costly results.

At this stage, the use of mobile telephones is the preferred option. The person in the field talks directly to the input operator, and the system rejects any errors the operators key in. These errors are referred back for correction while the yard operator is still at the site.

Another development being looked at is providing major customers with direct access to data with full security. The on-line inquiry facilities will enable customers to monitor progress of their consignment, reserve train slots, and order empty wagons for loading.

TIMS has already changed the nature of AN's operations. Developments such as the advanced train control system that AN is installing will mesh with the TIMS network and facilities and lead to improved efficiency and better service to customers.

David Watkins, the maker's representative, with one of the new electronic information display modules being installed at Melbourne'e Spencer Street Station.

V/LINE PASSENGER INFO GOES ALL-ELECTRONIC

Passengers on V/Line using Spencer Street Station in Melbourne will soon be reading their passenger information from $1.3 million electronic displays.

They will also be hearing that information from the integrated public address system, which will automatically broadcast announcements from a digital voice store.

The new passenger information system is a world first — and it's all-Australian.

The 39 main boards have electromagnetically-operated liquid display modules, which work simply and reliably. Driven by computer, the new system is governed by a central master clock. The Stationmaster can override it to make changes to timetables and announcements so that passengers can be notified immediately.

Platform supervisors use control consoles to advise passengers of any changes to imminent arrivals and departures.

The manual system has been in operation since the station opened in 1963, and, according to staff, it is "fiddly" when there are quick changes to be made.

The Manager of Rail Services Development, David Hardy, says the passenger display and the public address system are outdated.

"The level of traffic has increased, and the manual system can't cope with the number of changes and additions that we need to make daily," he says.

"We looked at a number of options, like the flap-top indicators used in airports, but none quite fitted.

"We needed a passenger information display system that could be read by visually impaired people and the elderly."

David Hardy says the new equipment was tailored for V/Line's needs.

"The individual modules, filled with opaque liquid, will contain the letters and numbers drawn in contrasting colors — blue on yellow.

"We took advice on the colors, and blue and yellow has the best legibility for normal-sighted people and good contrast for the sight-impaired."

There will be information displays not only on the platforms but also in the subway, in Tracks Cafe, the Tavern Bar and even in some Transport House locations.

The new PA system will be electronically linked to the passenger information display system, both of which will be computer-driven from the Stationmaster's office.

The manufacturer is A.D. Engineering, of Richmond. David Watkin has come to Melbourne from the firm's Perth branch to manage the job. He says the display modules are readable even in bright sunlight.

"They use no power once activated, and the display units themselves are dust and weatherproof. The PA system incorporates a digital voice storage system which assembles the messages from a library of phrases.

"We used the gravelly-velvet voice of Rick Stone, the radio announcer who is the John Laws of Perth."

The systems are being installed by both V/Line and Met electricians.

VERY FAST TRAIN

THE AUSTRALIAN RAIL PROJECT OF THE CENTURY IS GETTING UP SPEED

STUDYING THE VERY FAS

■ THE LATEST FRENCH TRIALS INCREASE OUR CONFIDENCE IN OUR ABILITY TO PROVIDE A RELIABLE SERVICE BETWEEN SYDNEY AND MELBOURNE IN THREE HOURS ■

The Very Fast Train (VFT) might also be called the Visionary Future Train, but for many people it is an extremely compelling vision.

The idea behind the VFT is to run a passenger train between Melbourne and Sydney at speeds of up to 350km/h, making it a three-hour trip. The VFT would be built and operated by a joint venture comprising BHP, Elders IXL, Kumagai Gumi and TNT.

The Victorian Government has welcomed the proposal, and it intends to legislate in the spring to assist the VFT's feasibility study by permitting access to land for survey and testing purposes.

The government has also set up an independent public inquiry into the social, environmental and planning impacts of the VFT.

Victorian Transport Minister Jim Kennan says: "The new technology fast train would have far-reaching economic and social advantages for the growth of this country.

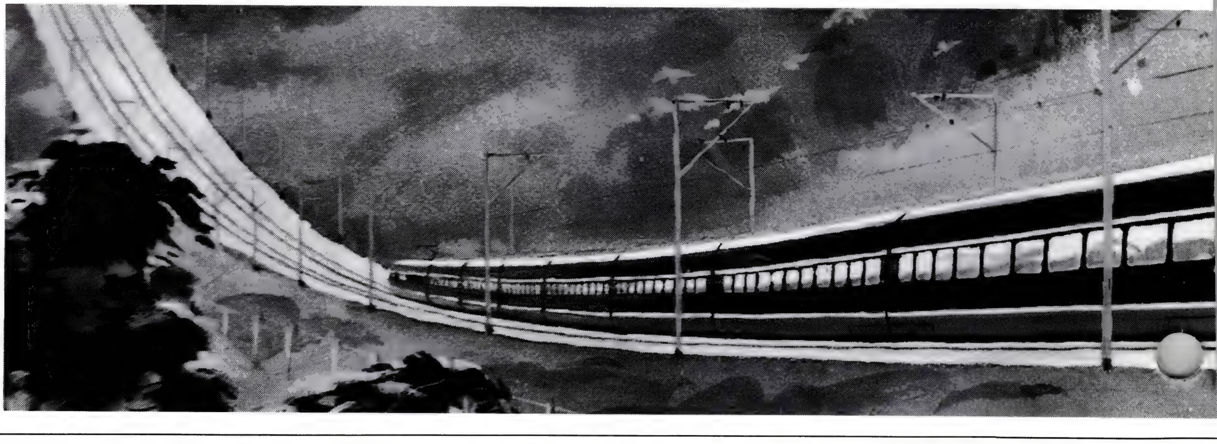
"The government has a responsibility to ensure that the public has an input in the planning process. It's important for the public interest in the environment to be preserved for current and future generations."

There seems little doubt that people all over the world want faster and more comfortable trains. Bullet trains have been running in Japan since 1964 at speeds of 250km/h. The French TGV gives patrons an even faster ride. And the Italians have their Direttissima (Express) plans while in Germany and Japan the magnetic levitation (Maglev) systems are being tested for commercial use.

Earlier this year, the French successfully tested their new TGV at nearly 410km/h, and it is thought that they plan to operate the new Paris-to-London TGV at 330km/h. The German ICE train (the Intercity Express) has the official world record for steel wheel on steel rail of 406km/h.

"We are on the right track with the VFT concept," says Alan Castleman, VFT chief executive. "The latest French trials increase our confidence in our ability to provide a reliable service between Sydney and Melbourne in three hours.

"We know there is a market for our services. We don't pretend that we



TRAIN

have all the technical answers at this stage. We have the confidence, but need to confirm it with a very detailed feasiblity study.

"I believe we're on the verge of a huge leap forward in rail transport around the world. During most of this century, rail remained in the steam-age mode.

"The interstate passenger trains today don't travel any faster than the London to Exeter train in 1854. Even though they have the XPT in New South Wales, it can only cruise at its full 160km/h capability for short distances.

"Its speed is limited by the infrastructure – the curves and gradients, the alignments of the past," Alan says.

"We're now seeing the sort of technical and cultural changes associated with the introduction of the Iron Horse 150 years ago, which brought such an improvement in the quality of life for so many people."

Alan Castleman believes the VFT is the safest and most comfortable form of transport – and the fastest for passengers travelling up to 1,000 kilometres. It is also the most fuel-efficient and economic way to move large numbers of people between cities, he says.

"With the VFT, a businessman, for example, could do so much more with his time compared with going by plane. There will be a phone available to every seat in business class, FAX machines in the carriage, and TV and video at each seat, among other executive services."

Alan Castleman says the VFT will have the latest in audio-visual technology, serve meals, snacks, and drinks, and sell magazines, newspapers and almost anything else passengers could want.

The train would have a new track, new signalling systems, and curves and gradients designed for sustained fast cruising speeds. There would be no level crossings – all crossings would be either above or below the track.

Within the State Transport Authority of Victoria, a special project group has been formed, led by Dr George Deutsch, Group Manager of Engineering and Development, to co-ordinate the Victorian Government's response to the VFT project.

The project is part of the Project Management and Development Department.

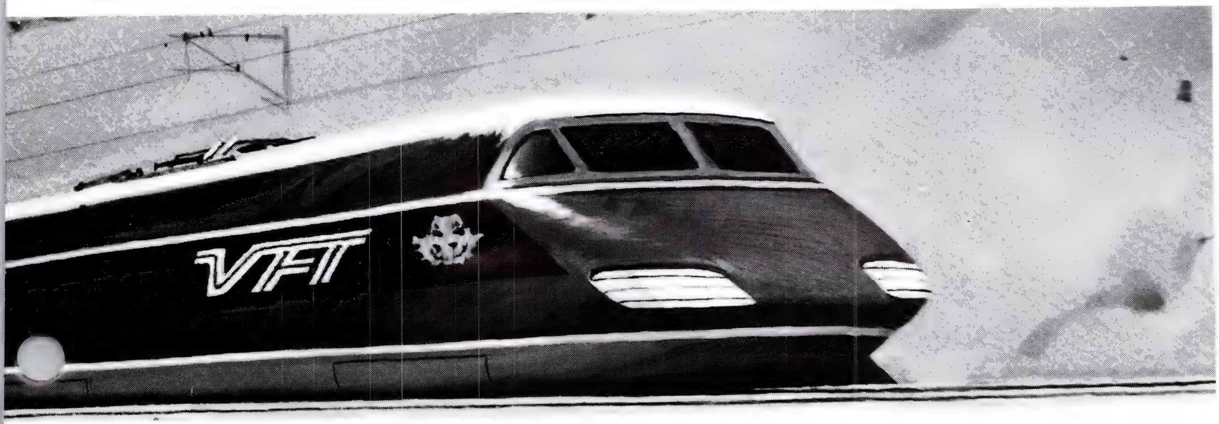
Dr Deutsch also chairs the Victorian Government taskforce on VFT, which includes representatives of interested government agencies. He also represents the Victorian Government on the Inter-Governmental Group (IGG) with representatives of the New South Wales, ACT and Federal Governments.

The IGG aims to co-ordinate the four governments' VFT activities.

According to V/Line's Fast Trains Project Manager, H.(Oz) Kayak, the Victorian Government is keen for the VFT study to assess all route options.

"It wants to learn as much as possible about the VFT and ensure that all the concerns of the community are fully considered," he says.

The project group is also studying the feasibility of a Fast Freight Train (FFT), which would run between Melbourne and Sydney on the existing north-eastern corridor, reducing transit times for freight trains to around nine hours (see



separate story).

“V/Line’s interest in the possibility of a faster and more competitive freight service to Sydney is independent of the VFT concept, but there could well be some synergy between the two,” Oz Kayak says.

“If rail is to increase its share of the expanding interstate freight market, it must aim to better match road transport in next-day delivery between the eastern seaboard capitals.

“There are also strong arguments for governments to upgrade the rail service to reduce the risk of road accidents, to reduce exhaust pollution and the cost of road maintenance.

“In short, we want to get the juggernauts off the road.”

As an experienced project manager, Oz welcomed the opportunity to work on the evaluation of two rail systems.

“We need to take things step by step,” he says, “but I’m optimistic about the future for both trains. Basically trains are the most efficient form of transport, and a fast train, as has been proved in Japan and Europe, is a winner.

“I’ts ultimately the way to go between big cities, for passengers and freight. Container traffic is also better suited to rail transport. A big Superfreighter carries as much as 30 or more semi-trailers fully loaded, and they will outpace trucks before long.”

The VFT Joint Venture has commissioned a full-scale feasibility study, to be ready by the end of 1990. It has already released a concept report that identifies the key issues of likely interest to governments.

The preferred VFT route has yet to be determined. The feasibility study is looking at a Gippsland route and a route via Albury. A requirement is that Canberra must be included.

Earlier work by CSIRO and by consultants raised the possibility of an 876km route from Melbourne via the Latrobe Valley, Bairnsdale, Bombala, Cooma, Canberra, Goulburn, Bowral and Campbelltown to Sydney.

In their concept report, the VFT joint venturers say they expect governments to show their support for the feasibility study three ways. They want them to grant access to land for survey and testing for route investigation, to assist the study through co-operation of departments and instrumentalities, and, provided due processes, including environmental effect studies, are satisfactorily completed, to undertake to support land acquisition for the route.

“One of my jobs is to establish the lines of communication between the different parties involved in assessing the likely financial, environmental and social impact of the VFT, ” says Oz Kayak.

“An important priority is to clarify the issues for the Victorian Government, including the responses of the various Victorian interest groups likely to be involved in the impact studies.

“This is an exciting time for the rail industry in Australia. We have the technical know-how and engineering

NEXT: THE FAST

In a recent accident near Gunning on the Hume Highway, six people died when a semi-trailer and three cars collided head-on.

Two of those killed were V/Line train drivers from Geelong. David Hewitt and David Lawson were on a train-spotting holiday with two other friends, who were also killed when the semi-trailer and their vehicle collided.

This latest tragedy sparked widespread calls for tougher restrictions on road transport and greater use of rail to move freight, especially on the Sydney-Melbourne corridor.

In fact, V/Line has been looking at ways of improving freight movement on the corridor for the past 18 months. And, with the New South Wales State Rail Authority, the system has come up with a plan for a nine-hour service between the two cities.

The service would compete with road transport in the overnight express freight market.

Known as the Fast Freight Train Project, or FFT, the plan has the support, in principle, of the Victorian Minister for Transport.

Studies show that the work needed for a faster freight service would include:

- Track renewal, bridge replacement and minor realignments between Melbourne and Albury.
- Limited yard remodelling, in particular at Junee, Moss Vale and Sefton.
- Extensive deviations and realignments between Junee and Moss Vale to give acceptable curve radii.

According to Mike Houston, V/Line’s FFT project manager, these improvements would enable FFTs to travel at their maximum speed for most of the journey.

“There would be no slowing down for curves or hills – it would be 115km/h virtually all the way,” he says.

“There are a number of options with a number of price tags.”

The cost of providing a basic FFT service is around $330 million, of which about $150 million would have to be spent in any case to maintain the present service.

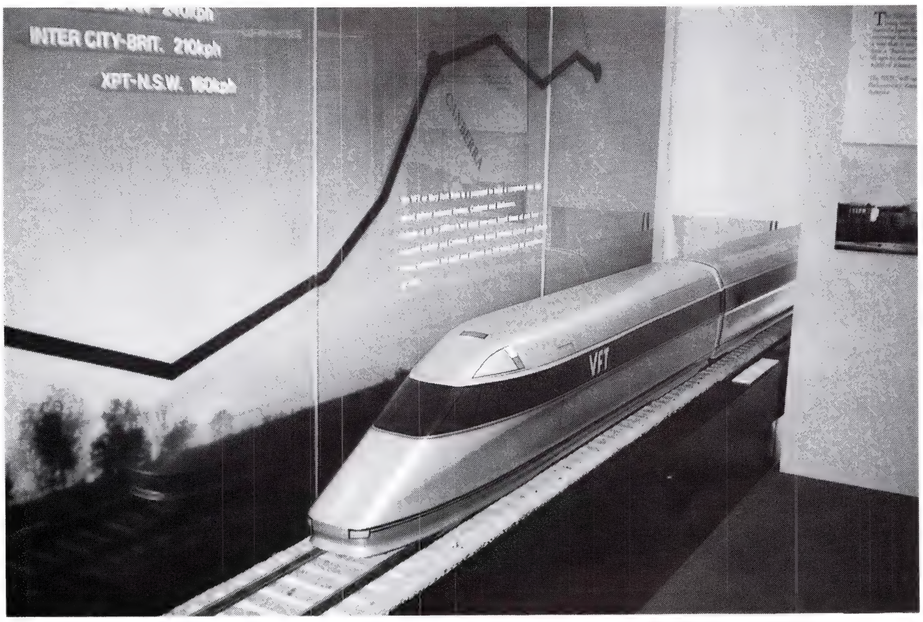
“There’s a lot of work that will have to be done, regardless of whether FFT goes ahead,” says Mike Houston.

“For example, most of the underbridges on our standard gauge line are due for replacement in the 1990s. When you subtract the costs such as this, the total cost of the project is significantly reduced.”

Another option is for 160km/h running on the present track alignment for a nine-hour journey. High-speed rolling stock would need to be introduced, but it would be limited to the present 20-tonnes axle loading.

“This would be far more costly, and as a result the 115km/h option is much preferred,” says Mike Houston.

“With improved track, you can have an axle load increase to 25 tonnes and, with further changes to the infrastructure, you can double-



Model of the Very Fast Train: The fastest transport for passengers up to 1,000km.

capability to build the world's best wheel-on-rail systems.

"Melbourne has its underground rail loop, and in Queensland the line to Gladstone from Brisbane has been electrified. Australia also leads the world in heavy haulage railway technology.

"Now we have the opportunity to be at the forefront of high speed passenger and freight railway engineering excellence," Oz Kayak says.

"The VFT could be going faster than any other wheel-on-rail train. In fact, it may be many years before magnetic levitation (Maglev) trains will travel commercially at anything like 350km/h – the cruising speed of the VFT – even though they've been tested at speeds above 500km/h."

The VFT Joint Venture has at this stage rejected Maglev; it would cost several times as much as the wheel-on-rail system and its development is still at an early stage.

"We're not ruling out the possibility of Maglev trains at some later date," says Alan Castleman. "The big investment with VFT is in the new track, establishing the permanent way for future fast trains on an alignment that might well later take a Maglev system."

As Victorian Transport Minister Jim Kennan says: "The 19th century was the age of rail, and the 21st century could well be the new age of rail."

REIGHT TRAIN?

stack containers and piggyback road trailers."

Many bridges and tunnels would have to be rebuilt to increase clearances to permit this. But it is considered wiser to invest in track and alignment improvements now.

If high-speed rolling stock is later introduced, it could then be used to its capacity and reduce the journey time to well below nine hours.

Terminal improvements are planned for Melbourne's South Dynon and Chullora, near Sydney, to handle the overnight door-to-door service.

New signalling is also on the cards, and, if traffic growth is high, extensive duplication or provision of long passing loops between Albury and Junee.

V/Line and State Rail would not, of course, be the sole beneficiaries of the FFT.

At the moment some 2,000 semi-trailers ply the Hume Highway between the two capitals every day. By getting much of this traffic off the roads and onto rail, there would be fewer accidents, road maintenance costs would fall, and traffic conditions on the Hume would be greatly improved.

In addition, less fuel would be needed to move the same amount of freight by rail. The average truck uses half a litre of fuel a kilometre and carries one container. A diesel locomotive, such as the new G Class used on Superfreighters, uses about five litres of fuel a kilometre, hauling 70 containers.

Australia imported a total of 6.5 billion litres of crude oil last year, adding more than $828 million to our balance of payment problem.

And, with local oil production falling as Bass Strait and other deposits dry up, the cost of oil imports is expected to approach a staggering $5.5 billion a year by 1998.

Saving fuel has another benefit: more rail freight would significantly reduce pollution. The less fuel used, the less carbon dioxide and other toxins pumped into the atmosphere, and the less the Greenhouse effect is made worse.

With FFT, the rail systems would be able to offer a much faster service. It is another public benefit that some important problems would be reduced in the process.

The name FFT is the brainchild of Dr George Deutsch, Group Manager of Engineering and Development and chairman of the Victorian Government's task force for the Very Fast Train (VFT) project.

"Being involved with the VFT, I began to think of a title for a faster Melbourne-Sydney freight service," he says.

Now that the FFT studies have shown that a nine-hour freight service appears to be feasible, the project has widespread support.

"A market survey and economic analysis are the next stages – to prove our gut feelings that the FFT is worthwhile," says George Deutsch.

"In any case, there are some relatively cheap steps, such as rationalising speed signs en-route and not detaching locos at Albury, that can be taken almost immediately."

ELEMENTS

FIRE AND WATER HAVE BEEN THE CAUSE OF RAIL DISASTERS ELSEWHERE IN THE WORLD, BUT AUSTRALIA HAS BEEN FORTUNATE ENOUGH TO AVOID MAJOR ACCIDENTS TO TRAINS CAUSED BY THESE TREACHEROUS ELEMENTS.

Australia, the dry country, is extremely vulnerable to bushfires and railway locomotives, both steam and diesel, have been justifiably accused of starting a few.

Derailments have also started a few small fires but through patrolling, vigilance, and commonsense, Australia's railways have managed to avoid major bushfire accidents to trains.

Each year the rail network becomes a little more fire-resistant. New concrete bridges with ballasted decks, concrete sleepers, and microwave, radio, or coaxial or fibre optic cables all cut the fire risk. Even with timber sleepers, the track is remarkably fire-resistant, for grass can rarely heat the sleeper to ignition temperature.

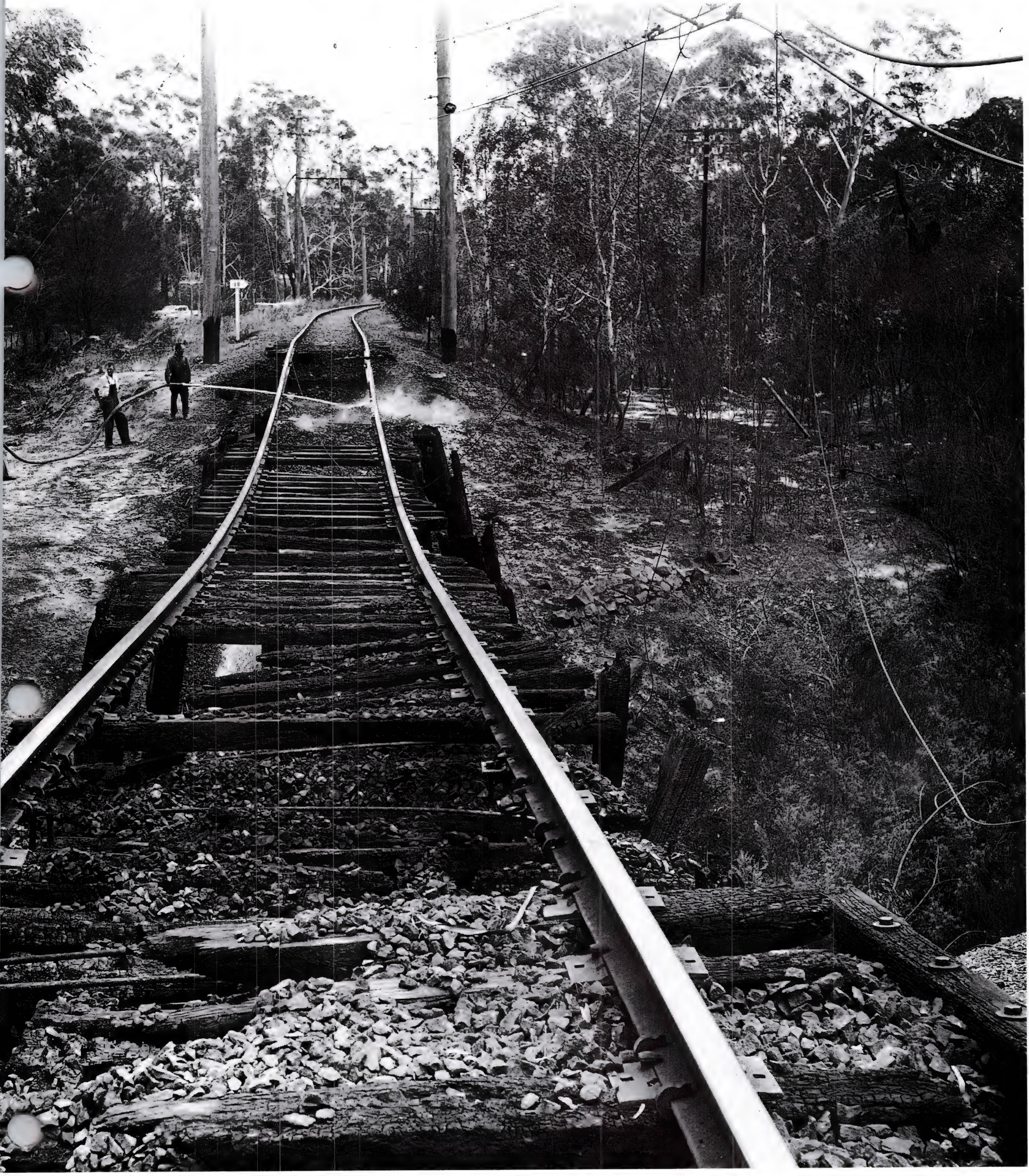
The main bushfire risks to the railway have always been timber trestle bridges and, to a lesser extent, steel bridges with open girders and combustible deck timbers above combustible trees and shrubberies.

Like North America, Australia was a land of timber trestles — not the high ones of the old West, built of half a pine forest, but low pile, post and deck beam trestles of Australian hardwood. Even after their replacement on export coal lines and electrified main line routes, Queensland, for example, still has more than 100km of classic Australian trestle railway bridge. But the bridges are on the way out, victims of the rising cost of quality timber, the scarcity of skilled bridge carpenters to work it, and the closure of the secondary routes on which so many of the timber trestles were found.

Concrete bridges don't burn down — but steel ones do. They are known to have collapsed after combustion of the timber deck and sleepers buckled their steelwork. In 1850, a wrought-iron tubular box-girder bridge was built by Robert Stephenson over the Menai Straits to link Wales with Anglesey Island. On 23 May 1970, this famous structure buckled, cracked and sagged so badly that it had to be cut down (and replaced by a steel arch). The culprits were two boys. Trespassing in the roof of the structure to do some birdnesting, they set fire to some very old, and very unwise, waterproofing made of tar-paper, wood, and bitumen. It seems amazing that in 120 years of steam, a locomotive spark had not done the job earlier.

SMOULDERING REMAINS Workers hose down what remains of a trestle bridge after a fire at Diamond Creek, Victoria, in 1969. Australia, like North America, was once a land of timber trestles.

OF DANGER



DESTROYED TRESTLE
Right: Charred remains of a trestle bridge, at Diamond Creek, Victoria, after a 1969 fire.

SASKATCHEWAN SNOWDRIFTS
Towering snowdrifts flank the Canadian Pacific snowplough on the Saskatchewan plains, Canada, where drifts of up to seven metres deep are not unusual.

In recent years, major bridge fires on the American railway network have numbered from four to twelve and losses from $500,000 to $35 million. All kinds of steel bridges have been damaged, ranging from modest plate girder and deck girder spans to large trusses and major arches.

The worst bridge fires have been caused by a derailed train's providing the initial fuel supply (for example, from a wrecked oil tanker), supplemented by creosoted wood decking and sleepers. Major and costly fires have also been caused by bush and grass fires and lightning strike, as well as by human carelessness and wickedness.

Repairs to the basic structure of a fire-damaged steel bridge can be very expensive, requiring destressing to relax dangerous locked-in stresses of unknown size and large-scale replacement of metal – even complete spans – by cutting and welding. This amounts to a major reconstruction job, done at short notice and under pressure in the field under the worst possible conditions. It is often cheaper to shore up the weakened span and make a new one for later installation.

CISCO ARCH. As an example of a bridge fire, consider what happened to Canadian National's Cisco Arch crossing over the Fraser River (and, incidentally, the rival Canadian Pacific) in British Columbia. The arch itself is an under-track structure 130 metres long and nearly 60 metres above riv level. But with one approach span on the eastern side and, including the spans over two tower structures, six on the western side, the total length is nearly 250 metres.

At 16.08 on 4 August 1977, several wagons of an 82-car train of phosphate rock (not much fuel there) headed by four SDP40 diesels derailed. Friction and sparks ignited creosote fumes from the sleepers and deck timbers. Fanned by a wind, the fire spread along the bridge from abutment to abutment, the fire-retardant material being ripped off. In the end, it took aerial water bombing to put the bridge fire out. Some cars could be uncoupled and drawn clear, but the derailed ones sank into the buckled deck, complicating the mess.

Paint discoloration showed that temperatures in the structure exceeded 500 deg C, and expansion exceeded tolerances, cracking the stout concrete abutments. Residual stresses detected in the structure of the 130m main arch meant it needed a number of new members at deck level. Four approach spans were replaced and three largely rebuilt. A ballast-deck was also put in to reduce the future fire risk. Repairs took 52 days, during which a 250km section fo the CN's transcontinental main was closed. The cost: more than $A10 million.

CHATSWORTH, 1887. The consequences of a train encountering even a short damaged trestle bridge can be serious. The world's worst railway bush or grassfire accident involved a trivial structure, a low, single timber deck span only 4.5m long and 4m high, set on timber abutments across a nameless minor stream. It took place 101 years ago, when the near-bankrupt Toledo, Peoria and Western RR had decided to recharge its empty till with a mid-summer excursion from central Illiinois town to Niagara Falls.

At $7.50 for the round trip, the tickets sold so well that most of the serviceable cars in the TP and W's rather ramshackle fleet had to be used. ON August 1887, they were assembled into a 16-car special with two 4-4-0 steam engines at the head. At the back was the shabby private saloon car of Mr Armstrong, the line's superintendent. There were 950 passengers aboard when this long, decrepit, kerosene-lit excursion train pulled out and clanked across the prairie. Not being fitted with air brakes, the maximum speeds were modest – under 70 km/h.

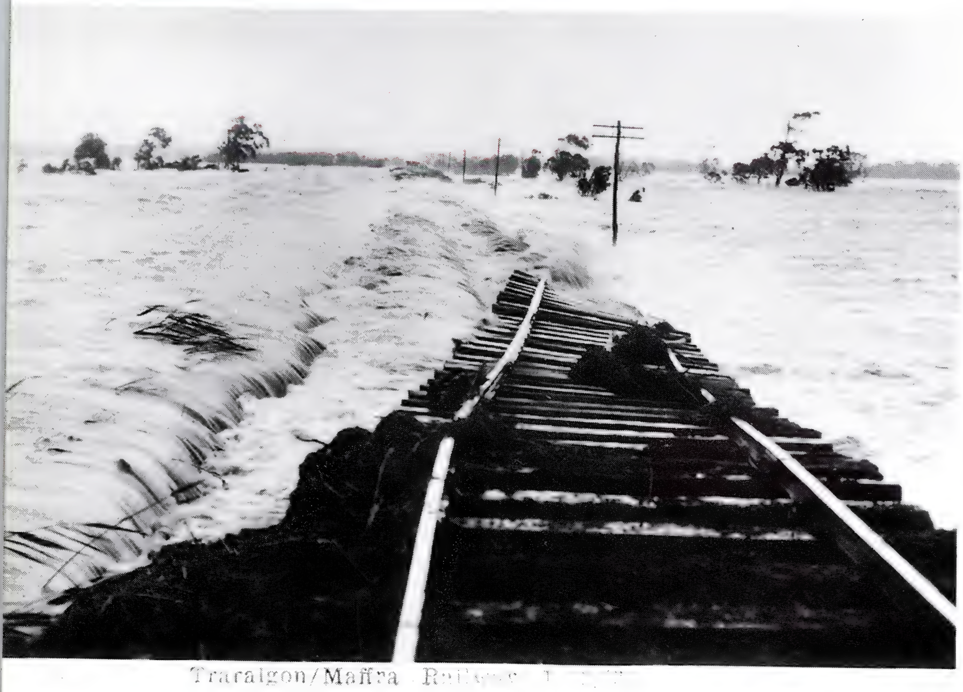
Just after passing Chatsworth, Illinois, Driver Sutherland on the pilot engine saw what he thought was a small grass fire beside the track. Then, to his horror, he realised that it was the bridge itself that was burning. It was the real stuff of late-Victorian drama: whistles screamed, both engines

CYCLONE HAVOC
Right: Queensland Railways staff working in difficult conditions to repair damage caused by Cyclone Charlie in 1988.

were thrown into reverse, men hurried to end platforms, and strong arms wound on the handwheels of barely effective hand brakes as the two engines rolled slowly – some reports say at only 30 km/h – onto the burning bridge.

Sutherland's pilot engine got over, as pilot engines did in many bridge disasters. But the train engine did not. Followed by the baggage car and eight crowded sitters and a sleeper, it crashed four metres into the creekbed. There formed upon it in a terrible slow-motion process of clanking, splintering destruction a pile of telescoped firewood, wheels, trussrods, broken kerosene lamps, and terrified people.

With more than 500 people caught in the wreckage, which quickly became a cremation pyre, it seems a miracle that only 82 were killed and about 200 injured.



GIPPSLAND WASHAWAY
A rare 1934 photograph shows the Traralgon-Maffra railway line broken by floodwaters.

Chatsworth was a particularly horrifying accident, with heroism, looting, and some trapped people shooting themselves as the flames advanced. The press had a field day. And just as after the Tay Bridge, a local ballad writer – anonymous this time – published some dreadful doggerel, which fired public opinion against the bankrupt railway and poor Mr Armstrong. Chatsworth became one of the legends of the rural mid-West.

As a later writer put it, nobody was ever called to account for either the wreck or the ballad. Chatsworth was an unavoidable wreck, made infinitely worse by all the worst features of the old, unsafe element of railroading. With air brakes, Chatsworth would never have happened, and, even if it had, strong modern equipment on the train would probably have prevented all but a few minor injuries.

WATER HAZARDS. The last of the Ancient Greeks' four elements is water. It h been thrown at railways in basically four varieties: fresh, salt, ice, and snow. The latter two do not greatly concern Australian railways. In other climates, ice remains a threat to bridge piers and, in poorly sealed tunnels where it will form stalactites, to locomotive windscreens. Snow has caused collisions from failures and masking of signalling equipment. In poorly-protected sections of mountain line, avalanches have overwhelmed trains. One of the worst was that which smothered the small railway town of Wellington, in the Cascade Mountains of Washington State, on 1 March 1910, taking two stranded trains and 90 people with it.

In exposed places, salt water has been very destructive to rail lines. Always at risk was a railway built in Florida in the US in the early 1900s by Henry Flagler to extend the Florida East Coast line for some 120km. It ran over low coral keys and on steel bridge from Miami on the mainland to Key West. Today, Key West is a US naval base. In Edwardian days, the ferry steamers to Cuba, something of an American colony, sailed from there.

While there were no engineering works of great note on Flagler's line, the whole project was a daring engineering concept and a daring investment, for it cut by more than half the steamer distance from Miami to Havana. A great tropical cyclone in 1912 demonstrated the size of the risk when it totally overwhelmed Flagler's line, washing many bridges and, except for the locomotive, a complete train into the sea. The line was abandoned and later rebuilt as a highway. With the spans battened firmly down on the piers, it is still there.

Rather more dramatic, and fortunately without loss of life, was the fate of the New Haven Railroad's crack Boston-New York Express, the Bostonian, when the train crew and 275 passengers were involved in surf rescue that cost one railwayman his life.

The route, the Shore Line, runs along the coast of Long Island Sound to New London, then Block Island Sound to Kingston, and Rhode Island Sound to Providence, Rhode Island. The double-track main line has to cross all the river estuaries, and, between Mystic and Stonington, it short-cuts across the open sea on a stone causeway 1.5km long. While behind Fisher's Island, the railway causeway is exposed, particularly to gales from the south-east. The water in the small sound is also shallow, making it possible for a hurricane surge to combine with heavy surf.

HURRICANE. On 21 September 1938 a hurricane was mounting along the New England coast when the Bostonian pulled out of Penn Station in New York City behind one

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AFTER GETTING THE ENGINE AND BAGGAGE CAR MOVING, THE TRAIN WAS STRUCK BY TWO WRECKED BOATS AND A FLOATING HOUSE.

of New Haven Company's 11 kv electric locomotives. The railway was running normally, and at New Haven the big electric cut off and a new streamlined steamer came on, crewed by Driver Easton and Fireman Horan. They pressed their train 102km along the Connecticut coast through rapidly worsening weather and reached Mystic soon before 5pm. It was quite dark, more than four hours before the normal sunset.

Pressing on, Easton moved his train at 30km/h onto a causeway over which water was starting to break. He reduced to a prudent 12km/h and was proceeding under a barely visible clear signal from the far (Stonington) side through rising water when the green switched to red.

Obedient to Rules if not to common sense, Easton stopped the Bostonian and climbed down to walk forward 180 metres through the knee-deep water pouring over the causeway. The wind all but blew him off his feet. Obtaining verbal clearance from the signalman in a box with all windows blown out, Easton returned with great difficulty to the headlight that marked his train. It now resembled a ship stranded on an offshore reef.

Driven by the storm surge, the water was now nearly waist deep, and several of the coaches were leaning outwards towards the sea where ballast had already washed from under the express. The last three steel cars were already washed off the track, only the strong couplers holding them on the causeway. After a quick conference, the conductor ordered that the 275 passengers be moved forward into the baggage car behind the engine. the van soon filled. People then climbed onto the engine, into the cab, and on to the tender. A member of the dining-car staff was washed away in the surf while helping his passengers. He was never seen again.

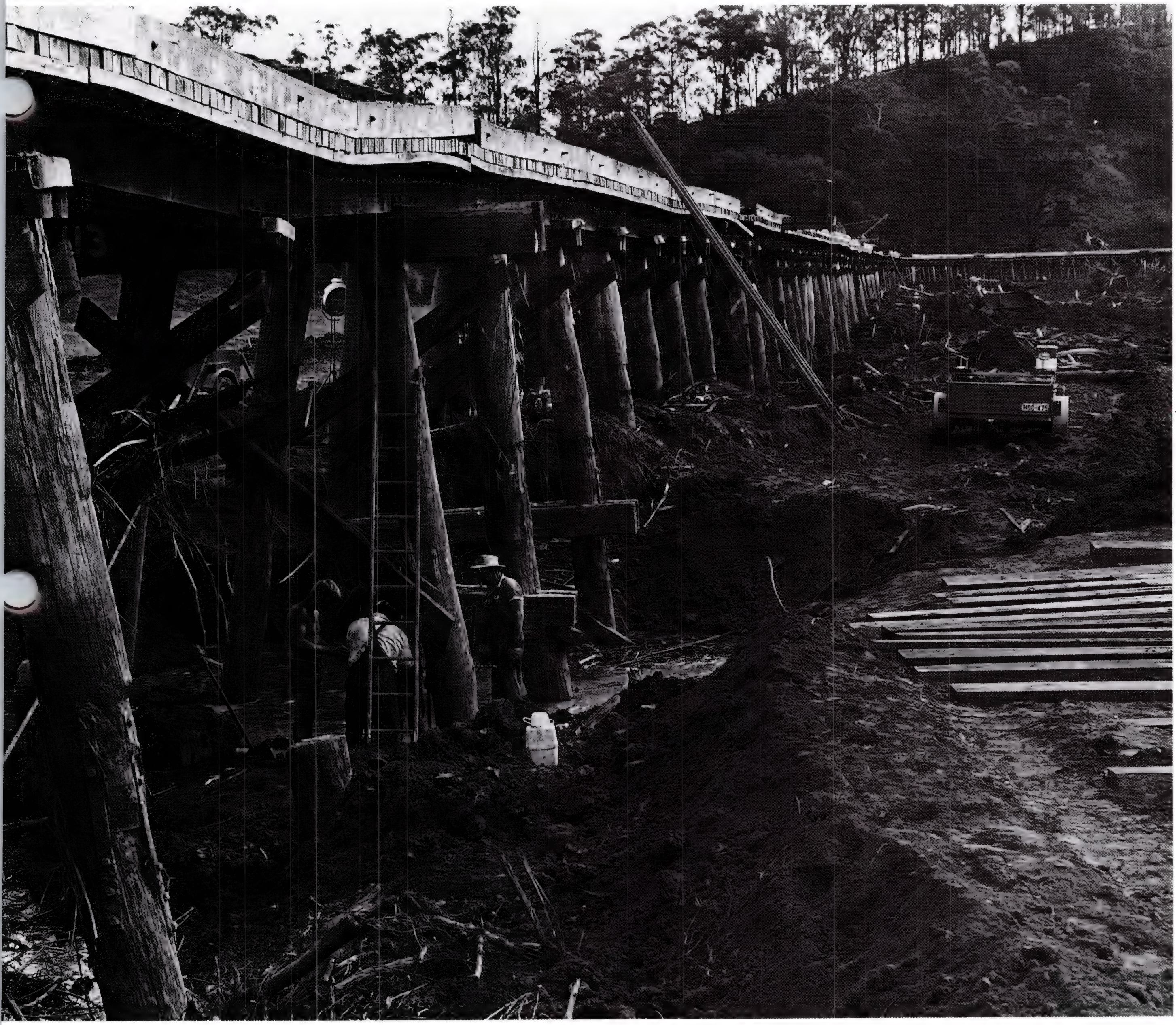
The crew had great difficulty uncoupling the coaches. Then, after getting the engine and baggage car moving, their truncated train was struck by two wrecked boats and a floating house. The engine had to push them out of the way to reach safety. Stonington's citizens took the passengers into their homes for the night, and the New Haven was closed for three weeks for repair.

Having received a garbled story that their crack train had been wrecked by a ship with a heavy loss of life, the relieved NH management was not about to criticise Mr Easton, the hero of the day. But after 50 years we may wonder why, with a hurricane about to hit, Control had allowed his train on to the causeway in the first place. And, finding himself there, why did Mr Easton stop at all?

The world's worst salt-water railway disaster, closely resembling Key West and Mystic, took place at the extreme southern tip of India. In 1913, the old South Indian Railway built a 21.5km causeway and bridge at Pamban. It took the railway out along the chain of low, sandy islands that forms Adam's Bridge, the vestige of a former land connection between India and Sri Lanka, now broken by Palk Strait.

At the end of this line, 685km from Madras, the cross-channel port of Dhanushkodi Pier was built, three hours sailing by the TSS Irwin from Talaimannar Pier in Ceylon. The line cut the travel time by 12 hours, and on it ran the Boat Mails, 101 Down and 102 Up, the fastest, smartest and most famous metre-gauge trains in South India. They had restaurant cars, were Pacific-hauled and timed on an 80km/h schedule to do the run in 20 hours. But the location was exceptionally exposed and vulnerable.

In December 1964, a cyclone and raging seas washed 124 spans off the Pamban bridge. The Southern Railway recovered them, rebuilt the structure and had 101/102 running again in just two months.



ORBOST FLOODS
Extensive repair work was needed on this long trestle bridge near Orbost in Victoria after severe floods in 1971.

But the sea was not to be denied. In 1974, a terrible series of cyclones struck up and down the whole Coromandel Coast, killing 20,000 people. Dhanushkodi was obliterated with a loss of 50 lives, and the port is today all but buried in sands. Now the shipping link ends at the better-protected mainland port of Rameswaram. The Boat Mail is gone, and Indian Railways has lost a legend.

SALT LAKE. Less well-known are the salt-water troubles that beset the Southern Pacific Railroad's famous inland route, the Lucin Cutoff over the Great Salt Lake in Utah four years ago. The first transcontinental line across the United States ran through low hills to the north of the Great Salt Lake, where the Union Pacific (from Omaha) and the then Central Pacific (from Sacramento) met at Promontory, Utah, on 10 May 1869.

In 1905 to by-pass the long hilly pull around the lake and save 70km, the SP built the Lucin Cutoff directly across the lake as the world's longest pile trestle: 21km. To cut maintenance costs, the timber trestle was later replaced in stages by an embanked fill, finished in the 1960s. In this lay the seeds of an unexpected ecological problem and near-destruction for the Cutoff itself.

Great Salt Lake was snow-fed from the south alone, but the major evaporation was from the north. And the new embankment had too few water openings to cope with nature's northerly water flow. Fed by the melting of a series of unusually high snowfalls, the salt water on the southern side of the embankment therefore rose. The Cutoff became a huge dam, with the rising water threatening to create a surf that would destroy the bank. The only solution was to close the Cutoff. Southern Pacific suffered huge revenue loss from the diversion of transcontinental traffic, as well as having to pay for urgent engineering work to cut openings and get the water level and the hydrology of the lake more or less back into balance. Some observers believe the cost almost ruined Southern Pacific.

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ULAN'S BLACK GOLD

Black coal is the biggest single commodity carried by the freight services of State Rail Authority of New South Wales. Millions of tonnes move to the seaports from coal mines in the Hunter Valley, the Western Coalfields, and the Illawarra District.

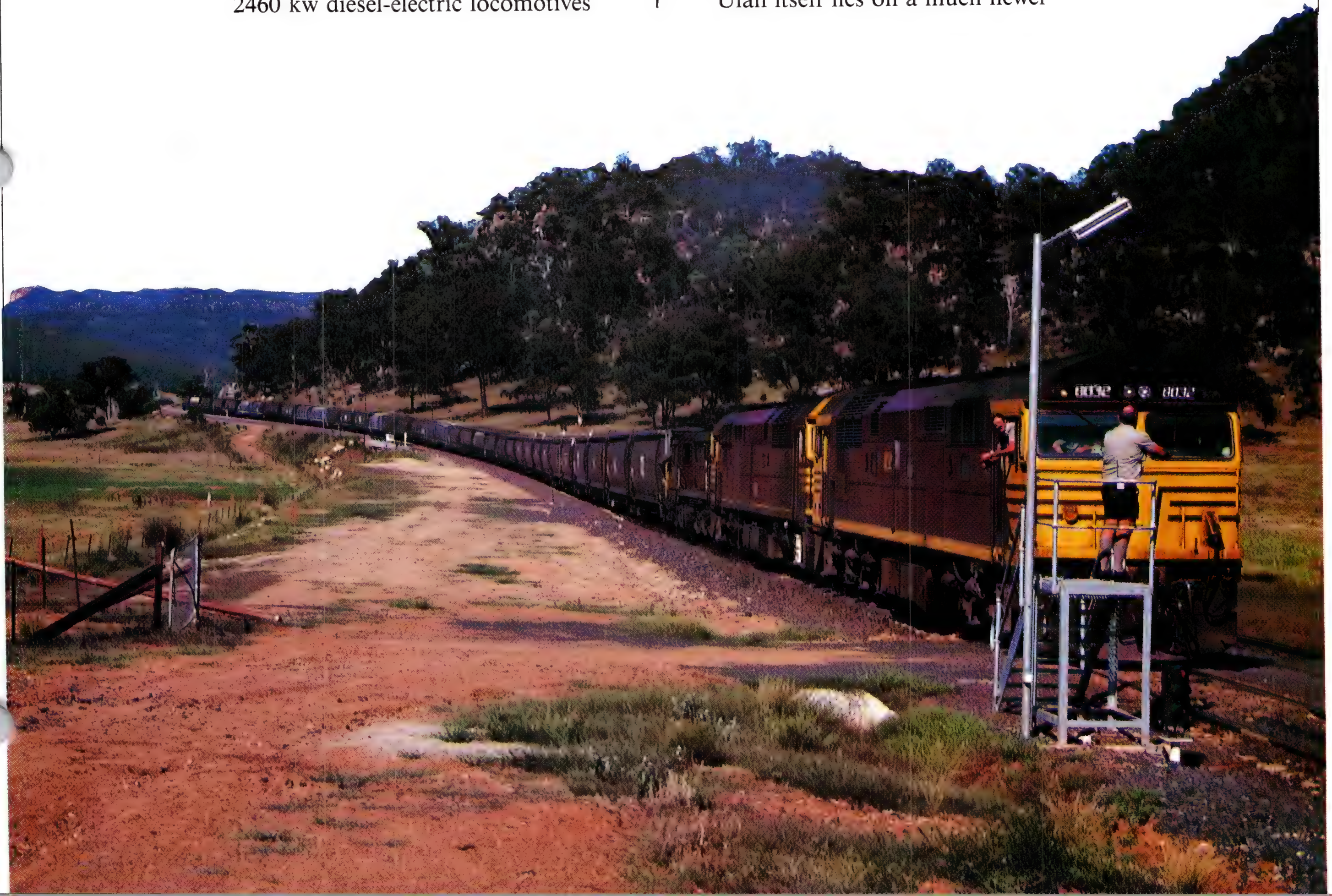
The longest coal trains in New South Wales run into Port Waratah from Ulan, 276km away on the eastern slopes of the Great Dividing Range.

Trains as long as 84 wagons (1.5kms) are hauled by four 81 Class 2460 kw diesel-electric locomotives from the balloon loop at the mine to the coal loading points at Port Waratah or Kooragang.

The Ulan line had humble beginnings. It started as a lightly laid branch line serving rural communities in the Upper Hunter, taking on its present role only recently.

The branch line from Muswellbrook to Merriwa was opened in 1917. Construction had taken five years and before that there had been many years of argument by the New South Wales Parliament over the route it should follow.

Ulan itself lies on a much newer



line that now connects Sandy Hollow (on the Merriwa branch) with Gulgong on the line between Wallerawang and Gwabegar. This now offers a cross-country link between the wheat fields of western New South Wales and the Port of Newcastle. It was part of a through link planned in the 1930s to continue beyond Gulgong to Maryvale, just north of Wellington.

Building the Sandy Hollow/Maryvale line began in 1937, ten years after the New South Wales Parliament agreed to build it. Work was patchy and slow, and for many years the line stood only partially completed, tunnels bored, concrete piers poured and steel trusses bolted in place on bridges – but no track. Work was hampered by a shortage of materials and funds during World War Two and some of the tunnels on the line began their commercial careers being used to grow mushrooms.

It was the prospect of coal development that spurred the completion of the railway. The 105km section from Sandy Hollow to Ulan was officially opened on 15 October 1982 by the New South Wales Premier, Neville Wran. The rebuilt 43km Muswellbrook to Sandy Hollow section and the open cut coal mine at Ulan were also commissioned at the ceremony. A State Rail XPT took guests from Sydney to the site at Ulan.

Today part of the original track from Sandy Hollow to Merriwa no longer has a regular freight service.

The coal run from Muswellbrook to Ulan operates seven days a week. There are other through trains, mainly wheat trains, on the line, which is single track throughout, with crossing loops worked by the electric train staff system.

Driver Tony Tobin and his assistant Norm Ross make the trip as part of their regular roster.

One day early this year the sun was clearing the heavy mist from the Hunter Valley as Tony brought his 84-wagon train to a stand in Muswellbrook station yard. A few quick checks, a discussion with Inspector Ken Pullen, and the empty coal wagons began their journey to the mine.

Just outside Muswellbrook the line crosses the Hunter River and then traverses flat agricultural land on the way to Denman.

The former farm branch line, now upgraded to mainline standards but retaining its original formation, winds around the top of a valley, along river banks, and crosses streams shrouded by drooping foliage to reach Myambat, the site of ammunition storage dumps for the Army's 2/22 Supply Company.

In the Hunter Valley, well-known for its vineyards, the line passes close

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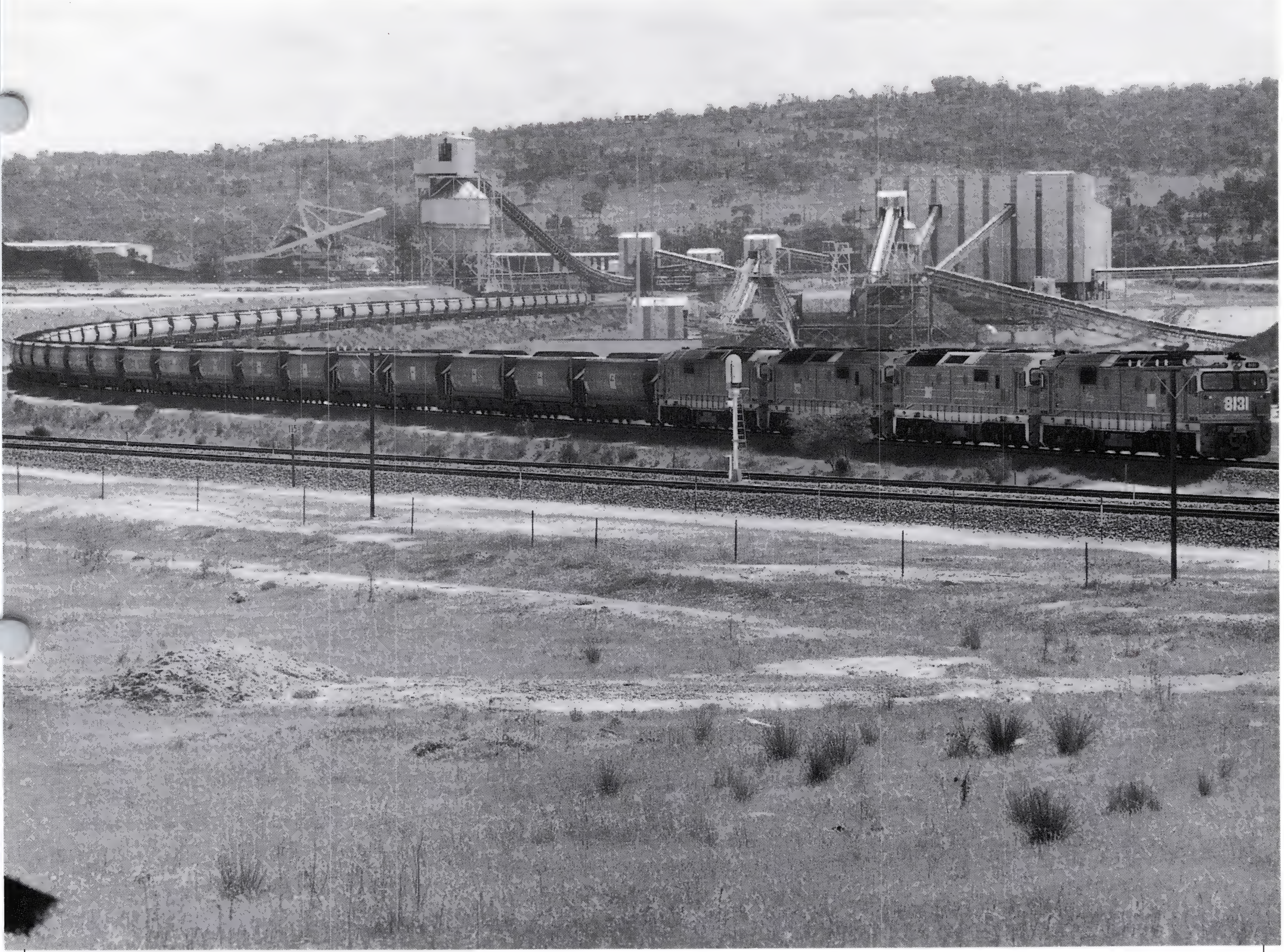

Coal loading area at Ulan Coal Mines, one of the State Rail Authority of New South Wales's biggest customers.

SOME OF THE TUNNELS ON THE SANDY HOLLOW LINE BEGAN THEIR COMMERCIAL CAREERS BEING USED TO GROW MUSHROOMS.

by the Rosemount property. Tony points out hills to the east where there are Aboriginal carvings in some of the caves.

Forty minutes after leaving Muswellbrook, the train stops at Sandy Hollow, where the train crew change the electric staff. The Ulan line leaves the Merriwa line at a junction just north of this point.

Now heading west, the railway sticks closely to the Goulburn River. Tony points out a convict-built coach road to the right and glimpses of the picturesque Whitton Valley to the left.

The summer sun is making its presence felt as the train comes to a stand at the home signal at Kerrabee. Norm gets out and turns the train into the loop.

These switches are of the "trailable" type, so that a train in the other direction will automatically reset them for the main line. Tony brings his train to a stand in the crossing loop and the men wait nearly 50 minutes. Norm is ready with the electric staff for the train coming towards them – a train laden with wheat from the inland.

At 9.40am, the train resumes its westward journey, passing through three tunnels near the small township of Bylong.

Number 1 tunnel, known as Cox's Gap tunnel, was excavated by 1946 and lined in 1949. It was used up until the construction of the railway line as a single-lane roadway and shortcut to avoid crossing the mountain range section. Number 2 tunnel brings the line into a broad sweeping valley, with a complete change of landscape.

Number 3 tunnel is the interesting one. Five hundred metres from each end were built during the early construction period and lined with concrete. The rest was left with drives incomplete.

At 1975 metres, it is now the longest tunnel on the New South Wales railway system. Because the tunnel slopes upward from each end to the middle, special precautions are taken. Respirators are carried on every locomotive, and everyone on the train must be certified as knowing how to use them should a locomotive fail and

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Previous page: State Rail test coal train with dynanometer car on its way to Ulan.

Above: State Rail coal train beside the Goulburn River near Sandy Hollow.

the train come to a stand. Diesel fumes could prove dangerous.

Fortunately, the need to use this equipment in Number 3 tunnel as a result of trains coming to a stand has never arisen. The use of respirators in any emergency is entirely at the discretion of the train's driver.

Number 3 tunnel brings the train into the Bylong Valley, with eucalypts in white flower lining the track. There are many stud farms in the area, and the Willesee farm is close to the line.

Tony points the site of the ballast siding where the main construction camp was built. "They had a first class French chef," says Tony, a man with a keen interest in food.

An eastbound coal train crosses at Coggan Creek, again with the assistance of Norm turning the train into the crossing loop. This takes 20 minutes and then on through another tunnel – the Wollar Gap. The hillside above the tunnel is so shallow that these days one wonders whether a cutting would not have done the job.

Soon afterwards, the historic village of Wollar is seen to the left, with emus grazed contentedly in the paddocks to the right.

Ahead lies Ulan, the train's destination. The train goes through the passing loop, and then into Ulan coal mine's balloon loop, leaving the line continuing to Gulgong on the left.

At 11.40am the train pulls up at the entry to the mine's loading bin just seven hours after leaving Port Waratah. Tony and Norm are taken by car to the barracks at Mudgee, specially built for the crews working the Ulan line.

Another crew will come on for the train's journey around the loop, its progress carefully controlled by a "crawler" device on the locomotive. The new crew, will take the train back to the coast, its mass of 8,400 tonnes feeling the grades more clearly this time.

The Ulan mine, owned by the Ulan Coal Mines Ltd, is one of State Rail's major customers. Last year, State Rail moved 6 million tonnes along this line that began its life with a quite different task.

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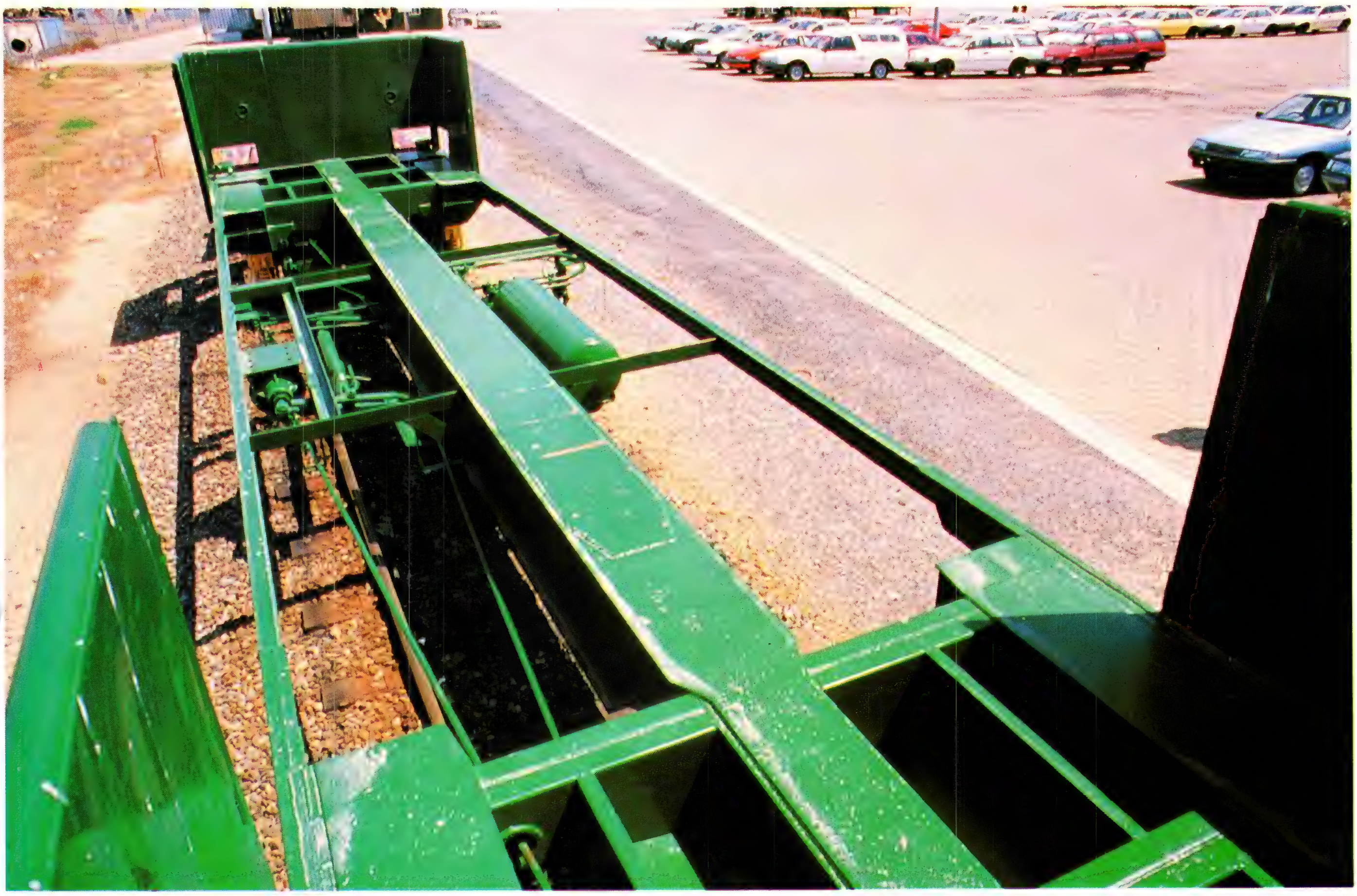


AN's new four-wheel wagon prototype, an SGBZ wagon cut in half and fitted with a 6.1 metre extension in the middle.

AN TESTING NEW WAGON

Four-wheeled two-axle wagons have been used for years, but it is only recently that the full potential of these two-axle wagons as high-speed, light-tare vehicles has been realised outside Europe.

Australian National has tested a new four-wheel wagon prototype — and AN's engineers are delighted with the result. The wagon is one of several ways of increasing train sizes, speeds and payloads being investigated.

According to AN's Chief Mechanical Engineer, Mr Les Smith, the four-wheel wagon will be able to carry 23-tonne axle loads at speeds of up to 110 km/h over AN's track.

The wagon is a converted SGBZ wagon, built at the Islington workshops in the early 1970s and used to carry grain on standard gauge. It was cut in half and a 6.1-metre extension fitted in the middle. Light side sills were retained for safety on the skeletal frame wagon, reclassified AQUY.

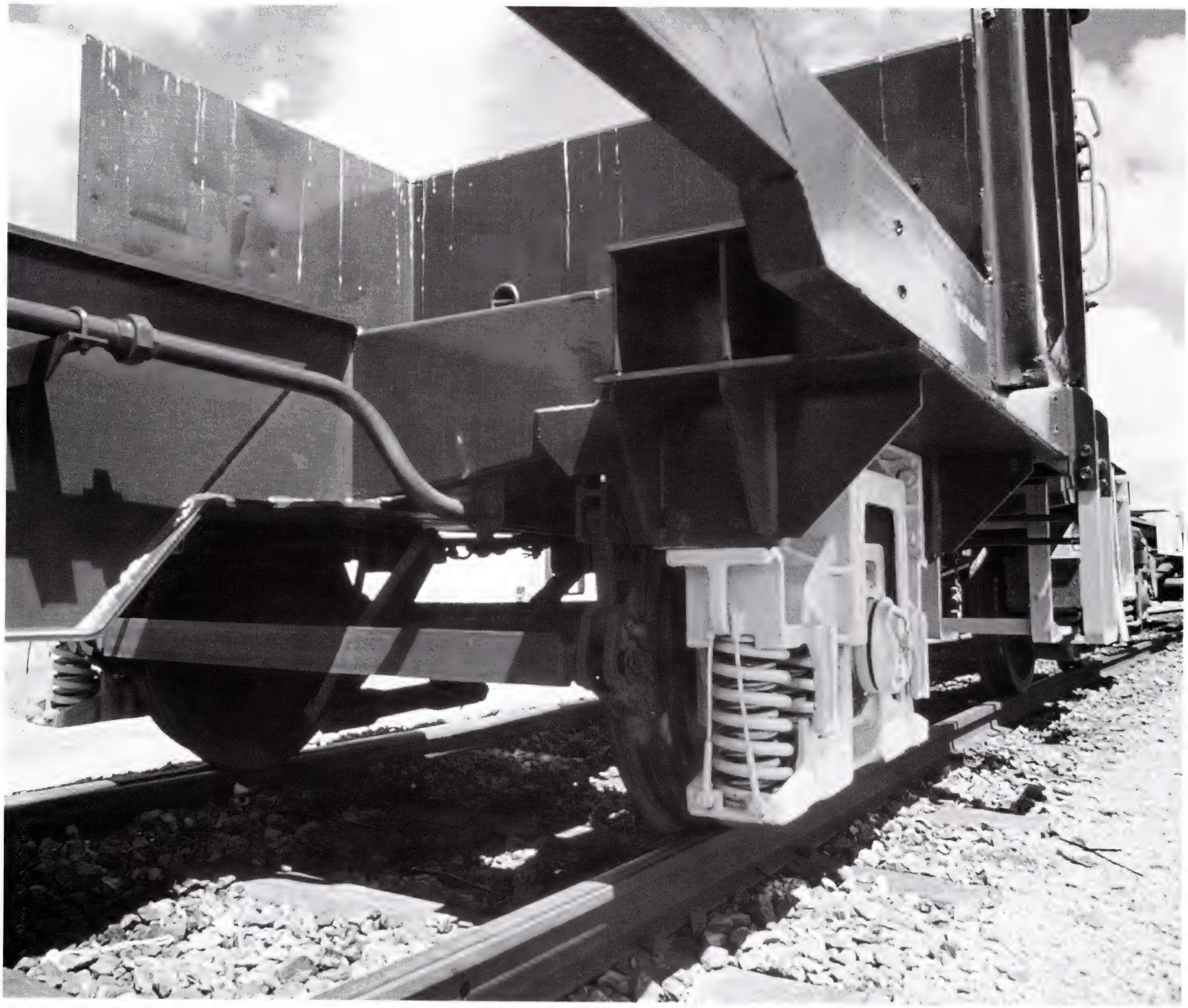
The suspension system was replaced with two National Unitrucks supplied by Commonwealth Steel/Bradford Kendall.

"The Unitruck was developed by a North American company, National Castings, for the English market and was a new concept, using coil springs and friction wedges for damping to reduce maintenance," Les Smith says.

"The system has a lateral motion, which allows the wagon body to 'swing', thereby reducing lateral forces, and longitudinal movement, which allows the wheel conicity to steer the wheel set."

Four-wheel wagons, ideal for small loads, were traditionally used in Britain and on the Continent. India, Malaya, South Africa, Argentina and all Australian state railway systems followed the British tradition and used similar wagons. New Zealand had as many as 33,000. The Australian Commonwealth Railway, however, used very few.

In the early 1950s, the European users developed a system of links so that the wagon body could be suspended



Coil spring suspension system of the AN four-wheel wagon prototype is the Unitruck, developed by a US company, National Castings, for the English market.

from the leaf springs, allowing a lateral swinging motion and therefore travel at higher speeds.

Australia did not follow suit, and the four-wheel standard-gauge and broad-gauge wagons were restricted to 60-70km/h, compared with their 110-120km/h speeds in Europe.

Unlike the European rail systems, North America used bogie (eight-wheel) wagons, which were larger and more stable over rough track. The Trailer Train Company became interested in the four-wheel wagon idea after the length of semi-trailers was increased from 12.19m (40ft) to 14.6/15.2m (48/50ft). The bogie wagon, carrying two units weighing 32t (tare), had to be longer, and therefore heavier, if it was to carry the longer semi-trailers. An ideal solution was the four-wheel wagon: a 15.2-metre two-axle wagon for piggyback use has a tare weight of only 12.5 tonnes.

The Association of American Railroads tested Trailer Train's two-axle wagons for stable running up to 119.9 mph (193 km/h).

"AN testing to date has only been to 130 km/h, and the results surpass all previous bogie wagon tests," Les Smith says. The wagon has been released for unrestricted running on AN's standard-gauge tracks.

AN gains several advantages from the four-wheel wagon. Its construction is simple, it is of light tare, it offers flexibility of operation, it can be coupled into "sets" without the tare to load braking problems of articulated sets, and it has a low unsprung weight.

If AN goes ahead with manufacture of the four-wheel wagons, they will probably be coupled in packs of four or five wagons and used in a similar way to the successful articulated 5-packs.

The four-wheel system holds promise for the proposed double-stack articulated container well wagons, where this single-axled bogie could be fitted to the ends to save costs and tare weight.

WESTRAIL SAND CONTRACT MEANS NEW LOCO NO 16

Westrail has ordered another new-generation locomotive for country freight, taking the number on order to 16, worth about $43 million.

An increase in the freight Westrail will carry is behind the order for the extra locomotive. The 16th P class locomotive will help rail 400,000 to 500,000 tonnes of mineral sands from Muchea to Kwinanna on behalf of the Cooljarloo Mining Corporation.

“Westrail has received a letter of intent from the company, signalling it will use rail as its transport system,” said the Commissioner of Railways, Dr Jim Gill.

“The project is expected to start in 1990 and has a 20-year life.

“Aside from the P class loco, Westrail will also build wagons, a siding at Muchea and dual gauge access at the AIS siding at Kwinanna.”

The wagons will back-haul the 100,000 tonnes of coal needed by Cooljarloo for fuel. The coal will be railed to Muchea from Collie.

The new generation locomotives will operate throughout the Westrail network, replacing the double-header locomotives to optimise the use of Westrail’s equipment.

Because of this, fertiliser and grain will be among the commodities the P class locomotive will haul.

The P class locomotive is a General Electric Dash-8 CO-CO (six DC motor-driven axles on the two bogies) with 12 cylinder 4-stroke turbo-charged engines producing 2,000 kilowatts of power (about 2,000hp).

“Because of their design, the P class locomotives will benefit Westrail’s bottom line with lower fuel consumption and maintenance costs,” Dr Gill said.

“The first of the P class locomotives, which are being built in WA by A Goninan and Company, will be available for use at the end of the year.”

The first of 15 locomotives were ordered in August 1988.

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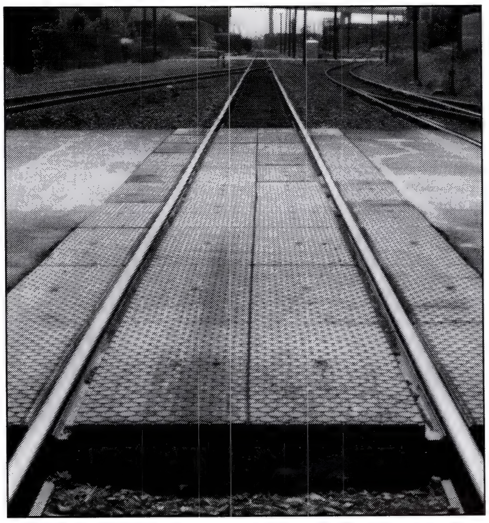


$400M BRISBA

Queensland Railways is to spend more than $400 million expanding the Brisbane region's commuter rail network.

The expansion program will include:

- Duplicating inner-city rail tunnels between Roma Street and Brunswick Street stations and the providing of a fourth track between Bowen Hills will and Brunswick Street.
- Building the high-speed Brisbane-Gold Coast line.
- Moving the freight terminal from the inner-city at Roma Street to Acacia Ridge on the south side.
- Providing an extra 36 cars for suburban traffic.
- Building additional tracks on sections of the metropolitan rail system.

These major improvements will greatly boost the carrying capacity of the rail network in Brisbane and will provide high-speed public transport along the Brisbane-Gold Coast corridor, one of Australia's fastest growing areas.

Four tracks between Roma Street and Bowen Hills will increase the capacity of the inner-city system by 60 per cent and will permit a more flexible response to any difficulties or

Brisbanes Roma Street Transit Centre, painted by Alan Purnell, one of six paintings commissioned by Queensland Railways as part of last year's Bicentennial and Expo celebrations.

NE EXPANSION

delays in train operations.

Peak-hour congestion is a major problem in the twin-track inner-city tunnels and is hampering expansion of services.

Since the introduction of electric trains in Brisbane in 1979, patronage has increased by 65 per cent to an annual total of 45 million passengers. Electrification of 360km of track on the metropolitan network was finished in February 1988 at a cost of $480 million.

A Brisbane-based consulting engineering consortium, the Connell Group, will design the two tunnels. Two tunnels, each carrying a single track, will be built between Brunswick Street and Central Station and also between Central and Roma Street.

The work will involve upgrading facilities for Citytrain passengers at the Brisbane Transit Centre at Roma Street and new island platforms at Central and Bowen Hills. The estimated total cost is $130m.

The $210 million Brisbane-Gold Coast railway is expected to be in use by the end of 1994. Electric trains will complete the 86km journey between Brisbane Central and Robina in 65 minutes, making rail competitive with road travel. Top speed will be 160km/h.

Extra track capacity between Brisbane and Beenleigh, 41km south of Brisbane, involves dual gauging and upgrading the under-used standard-gauge track between South Brisbane and Yeerongpilly, providing a third track for express services on this section, and duplicating the single track sections between Kuraby and Trinder Park and between Woodridge and Beenleigh. This duplication requires extra platforms at a number of stations along the route.

New track between Beenleigh and the Robina terminus will extend for 46km and include five stations. Initially, 30 cars worth $55 million will provide a half-hourly service at peak-hour and hourly at other times.

Additional track and improved signalling between Bowen Hills and Northgate will boost the North Coast Railway. In addition, duplication between Manly and Lota on the south-eastern line to Cleveland will allow more trains on this corridor.

The first of 36 new suburban cars costing $57 million are expected to enter service in 1992, joining the present 264-car electric fleet.

Redevelopment of the Roma Street railway yards will provide for a mix of retail, office and residential space. The freight terminal at Acacia Ridge will accommodate intrastate as well as interstate freight by 1992.

Modernisation of the Brisbane railway system and the extension of electrification to the Gold Coast will further boost patronage and ensure rail's transit role in south-east Queensland well into the 21st century.

FARES GOING AUTOMATIC

State Rail has moved closer to automatic fare collection at its main city stations by calling for tenders to provide the new $55 million system.

The new system will be compatible with the AFC system now being installed for Sydney Harbour ferries to allow interchange ticketing.

The plan for AFC was part of the CityRail strategic action plan released last week when NSW Government announced that it would spend $2 billion over five years on the Sydney system.

CityRail Group Manager Rob Schwarzer said the world's most advanced automatic fare collection would be introduced on the Illawarra Line in 1991 and would cover the whole CityRail network by 1993.

"Automatic fare collection will be the major initiative in controlling fare evasion, which is estimated to cost between $20 and $50 million annually," Mr Schwarzer said.

Major components of the new AFC are electric ticket vending and booking office machines and barriers, computers, and a network to transfer data between the central computer and station devices.

All stations will get ticket vending machines fitted with a help button to speak to CityRail staff.

Mr Schwarzer said electronic barriers would be installed at entrances and exits at the city and major suburban stations where more than 80 per cent of customers enter or leave the network.

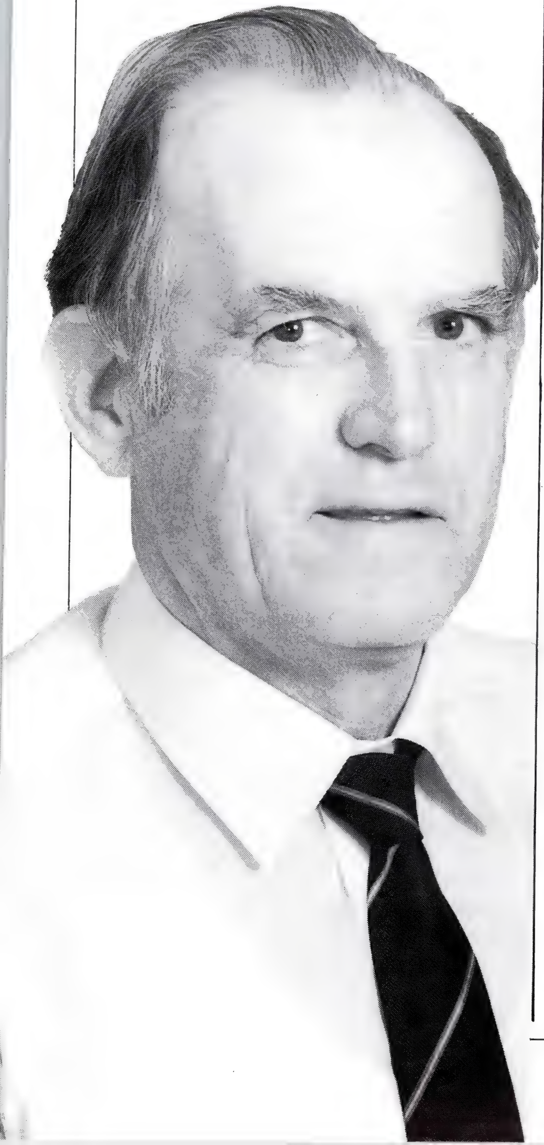
"At other stations, ticket examiners will check tickets on a random basis," he said.

"AFC means station staff will be able to concentrate on the more rewarding role of caring for customers through station presentation and improved passenger information."

INSIDE W
ATP SYST

> **‘Perth’s new electric trains will run at high densities and speeds up to 110km/h. This increases the risk of human error, and we simply aren’t willing to take any chances. The ATP technology reduces the human error risk to almost zero.’**

Don McCauley, Westrail’s Manager Signals



Westrail has received the first shipment of transponders for its automatic train protection system (ATP).

Installation of the transponders will begin in August, and they will be used in Perth’s new electrified urban rail system, due to begin operations in 1990.

The transponders are part of a Swedish ATP system that will have cost almost $2 million when completed. The system ensures that red signals are heeded. If the driver doesn’t respond to warnings from the ATP, the ATP begins braking the train well before the signal.

“Over the years, we have had several incidents of drivers going through red signals,” said Don McCauley, Westrail’s Manager Signals.

“Fortunately, no great damage was done. But similar mistakes by drivers on other railways have caused serious accidents. For example, a collision in Brisbane in 1985 caused an estimated $1.2 million in equipment damage alone. And there have been worse accidents in the UK.

“Perth’s new electric trains will run at high densities and at speeds up to 110km/h. This increases the risk of human error, and we simply aren’t willing to take any chances. The ATP technology reduces the human error risk to almost zero.”

The first signals protected by Westrail’s ATP will be in the Perth’s inner-city area: Mt Lawley to West Perth and Belmont Park to Claisebrook stations. Theses lines merge here, and Westrail sees this as the area of greatest risk. Empty trains moving between the City and Claisebrook stations are another hazard.

The EMU’s for Perth’s new urban electrification system will carry ATP processors and equipment. So will Westrail’s popular Australind country passenger train on the Perth to Bunbury route.

The ATP chosen by Westrail is a version of a system sold by Standard Radio and Telefon AB of Sweden. Similar systems have been used by Swedish Rail since 1980.

Westrail’s ATP will be similar to one installed by Queensland Rail between Caboolture and Rockhampton, although that system was supplied by a different manufacturer.

The ATP get its information from signals and at other strategic points along the track. Main-line signals normally have two sets of “approach” transponders as well. The first ones are at the minimum braking distance from the signal, and the second at half braking distance.

The transponders inform the ATP about the state of the signals. They also supply other information, such as allowed line speed, distance to the next signal and, where necessary, the gradient to the next signal. If the amount of information overloads the signal transponders, extra transponders are installed.

For reliability, all transponders are installed in pairs. Their electronics are housed in stainless steel for shielding against electrical interference and water.

The transponders are activated by a continuous 27 MHz radio signal which not only activates the transponders as the loco passes, but also supplies the power needed for a return radio signal to the loco. No batteries or external power supplies are needed.

The transponders send a coded signal at 4.5 MHz and continue sending it as long as they receive enough energy from the 27 MHz loco beam.

Signal transponders get their information about signals from an

STRAIL'S
M

encoder, which gets the information from a direct connection to the signal control relays.

In Perth's new electrified urban rail system, a yellow or green main signal will mean the track is clear to the next signal – plus a specified overlap distance. A yellow signal means the driver must expect to find the next one at red.

If a train passes a yellow signal, the ATP will supervise the train so that it stops before it reaches the red signal. or at least within a pre-determined overlap of it. But as the signal may change before the train has stopped , the driver can "ease up" the ATP control. He can continue at a reduced speed or sometimes even increase to normal track speed, depending on the circumstances.

Two microprocessors in the loco cab act as a tireless electronic supervisor, one that takes control if its warnings and instructions are not obeyed. Each microprocessor uses information from the transponders and each has its own memory and input ports. One processor controls the output, and if this processor fails, control automatically passes to the other.

The ATP ensures that the maximum allowed line speed is not exceeded. First, it warns. Then, if the driver does nothing, the ATP applies the brakes until the train slows to the allowed speed.

"The problem with ordinary warning systems is that the drivers get too used to them," said Don McCauley.

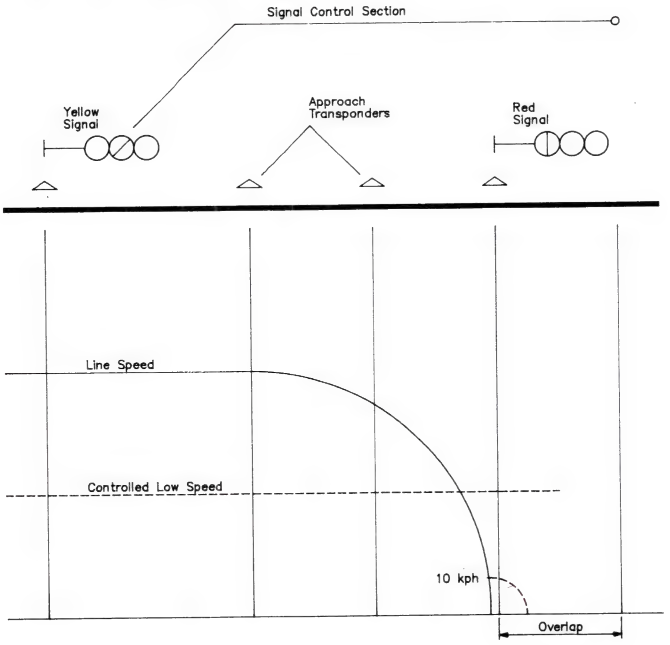
"A driver can become blasé. He might acknowledge a warning without thinking – then do nothing about it.

"There can be exactly the same problem with an assistant driver using a vigilance control."

But the ATP system does more than stop the train at red signals or act as a speed cop.

It also keeps the train at an optimum speed if a red signal changes while the driver is still braking. The ATP lets the driver release the brakes after the train has reached the lower speed limit (set at 40km/h for most signals).

Until it reaches the signal, the train runs at the lower speed. The transponders at the signal then updates the permitted speed and the train can accelerate to the normal line speed.



ATP SYSTEM
TYPICAL ARRANGEMENT

There is a useful variation to this: an even lower "lower speed limit" (10km/h) can be applied to a signal. This can be useful if the normal overlap distance (equal to the emergency braking distance from 40km/h) is too generous and it restricts train operations.

If the driver has been slowing down for a red signal but then releases the brakes and goes through the signal, the ATP applies the emergency brakes. The train then stops in the overlap allowed for that signal.

After a train passes through the yellow signal, it continues at line speed until it reaches the point where braking must begin if the train is to stop before it reaches the red signal. There are usually two sets of approach transponders – the first at braking point. The train continues braking as it passes the second approach transponder. If the signal has remained red, braking continues until the train stops (before it reaches the red signal).

If the second approach transponders send a message that the red signal has changed to yellow or green, then the driver can accelerate to line speed.

On the other hand, if the first approach transponders tell the ATP the signal has already turned yellow or green before the driver has begun to brake, the train is allowed to continue at normal line speed.

The ATP display, keyboard, microprocessors and other equipment in the cab will probably be installed in Queensland, where the EMU's are being built. But at this stage, Westrail want to keep all options open.

Once the parameters for the train have been entered into the microprocessor's memory, the driver will not normally have to change them. The parameters stay the same unless the train's length, its braking characteristics or the maximum allowed train speed change.

As the train passes transponders, the ATP display in the cab is updated. If there's a problem, the ATP sets off audible and visual warnings. The display shows the recommended speed and the target speed at the next signal.

The ATP microprocessors compare their stored information with data from the transponders, the train's speed, distance from the next signal, and the status of the braking system. The system is constantly looking ahead. If the train speed is too high, the microprocessor starts braking – through the driver, or if necessary, automatically. It makes its decisions by comparing the driving speed with calculated braking curves stored in the ATP's memory.

If anything goes wrong with the train's operation, the ATP automatically brings the train to a stop. This also happens if the ATP transponders don't receive an expected code from the transponders, or if they receive an invalid code.

Technically, it is possible for a driver to turn the ATP off and disregard it. But few drivers are likely to risk it, considering the system has a built-in log that shows if the ATP is turned off deliberately. Anyway, the system works to the driver's advantage.

"We are very pleased with the versatility of the system," said Don McCauley.

"For example, we will be able to vary the way we set up the approach transponders near stations and at level crossings.

"Later we may use the system to supervise curve speed and some other things – but we won't be doing this at the beginning."

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THE GREAT DEBATE

Heavy trucks are the main beneficiaries of government spending on roads. Should all Australians be prepared to subsidise road transport and bear the other costs heavy vehicles impose on society?

For many months now, a public debate has been going on over whether Australia spends enough on roads and whether large trucks pay their fair share of the damage they cause to our road network.

Road transport companies and road transport associations say that fuel taxes, registration fees, and other charges made on them are too high and should be reduced.

They, and others, also say that governments should spend more improving the road network.

Governments have carefully examined these claims to see if they are justified.

Independent bodies such as the Inter-State Commission, as well as other professional and responsible researchers, have found that road charges are much less than the full costs of road damage. The ISC recommended that charges on trucks rise to meet these costs.

These findings and others have led well-informed taxpayers and government agencies to suggest that taxes and charges paid by the road transport industry should be substantially increased. With that issue resolved, debate could take place about reasonable levels of cost recovery for all transport, including road and rail.

THE GREAT DEBATE

What's all this got to do with railways?

The railways are Australia's oldest, largest and most widespread freight delivery system. Together, Australia's taxpayers own the railways. Railways of Australia believes that some statements made in the debate on recovering road costs are biased and some are wrong. It believes that it has a responsibility to point out these biases and correct these errors.

Rail transport is a highly efficient way to move freight. Between 1976 and 1985, rail's share of Australia's non-urban freight task rose from 16 per cent to 20 per cent of the total. But in this time road's share rose from 12 per cent to 22 per cent.

Road transport has achieved much of the advantage it enjoys because of investments made by governments in national roads and the rural arterial road networks.

Rail systems must pay for all spending on their track and permanent way.

Australia's railway systems believe that the competition for freight should be fair, and that road transport industries should pay the full costs of their operations, just as railways do.

In 1988, the Commonwealth Government asked the Industries Assistance Commission to investigate a wide range of government charges, including rail freight rates. In response, the road transport lobby has already been advocating a rise in rail freight rates.

If rail freights rise, the road transport industry will win an even larger share of the freight business. This means taxpayers will pay twice – once for new roads and road subsidies, and again for the reduced efficiency of their rail systems.

We need to be sure that those who benefit from road subsidies cannot mislead the IAC or the public about what constitutes fair competition and assistance in the transport of freight in Australia.

The railways systems, government and taxpayers all have a vital interest in making sure that no-one has an unfair advantage.

TABLE 1
Domestic non-urban freight task (tonne-km x 10^9)

	1976	%	1985	%
Road trucks	23.00	12.0	47.87	22.0
Government rail	30.81	16.1	43.71	20.1
Other (1)	137.71	71.9	126.15	57.9
TOTAL	191.52	100.0	217.73	100.0

Note (1): Air, sea, non-government rail, utilities and panel vans.

Source: Nelson English, Loxton & Andrews Pty Ltd, "Consumption of Transport Energy in Australia 1984/85".

How much revenue do governments really collect from road users, and why?

TABLE 2 shows that in 1986-87, all Australian road users (private cars, trucks, buses) paid about $9 billion in fuel taxes and excise, fuel franchise fees, sales tax on vehicles and parts, registration fees, and o[illegible] charges.

Most of this money was raised by the Commonwealth Government as indirect taxation. It was spent on defence, justice, health, education and other essentials in the same way as levies such as import duties on jewellery, excise on beer and cigarettes, sales tax on television sets are spent.

This indirect taxation is a necessary and justifiable part of our public finance system.

The railway systems pay their fuel taxes just as road transport firms do, and very little of their taxes finds its way back to rail for investment in infrastructure. Quite simply, rail is financing its competitors.

It is clear that governments must *declare* whether the amounts they raise from levie[illegible] fuel are "taxes" or "charges for cost recovery". Only then will the arguments be resolved.

How much do governments spend on roads, and why?

IN Table 3, we see that together governments (federal, state and local) spend a total of $3.7 billion a year on roads. This is done through authorities such as state road authorities and local councils in building and maintaining our road system.

Of this, about 40 per cent is spent on maintenance (fixing potholes, resheeting sections of road with bitumen), about 30 per cent on "reconstruction" (rebuilding and renovating roads at the end of their life), and about 20 per cent on new roads.

However, this spending does not necessarily keep the condition of the road system constant.

Recent investments have been on the new National Road System (mostly intercapital routes) and on upgrading rural arterial roads. Australia can be justifiably proud of this system, now almost complete.

On the other hand, there are reports that the network of local farm-to-market roads has deteriorated markedly. Unfortunately, no-one knows the full extent of the deterioration.

What is clear is that unless those who benefit from road investment pay the costs, there will be a large misallocation of Australia's resources and wealth.

Governments should now make sure that Australia gets the best value from *all* its transport networks – road and rail – and that no further expansion of the road network takes place unless those road users who benefit most demonstrate their willingness to pay the costs.

But that is not the full story. A lot of "external" costs going with the use of roads are not paid by the road transport industry or by the road authorities.

TABLE 2

Estimated Government revenue from road use, by recovery definition, 1986-87
($ MILLION)

Type of tax or charge	All revenue from road use related activities	Revenue from charges unique to road users	Revenue hypothecated to road expenditure
Charges on sale of petroleum			
Excise on motor spirit and diesel	5 376.3	5 376.3	1 334.1
Petroleum franchise licence fees	672.0	672.0	350.0
Total	6.048.3	6.048.3	1.694.1
Federal (Interstate) registration	1.5	1.5	1.5
Customs duties			
Motor vehicles and parts	220.0	. .	. .
Petroleum	20.0	. .	. .
Total	240.0	. .	. .
Sales taxes			
Motor vehicles	1.000.0	. .	. .
Parts and tyres	500.0	. .	. .
Total	1.500.0	. .	. .
State motoring charges			
Vehicle registration fees	1 070.0	1 070.0	1 070.0
Drivers' licence fees	170.0	170.0	. .
Road transport and miscellaneous taxes	10.0	10.0	5.0
Stamp duty on registration	440.0	. .	. .
Total	1 690.0	1 250.0	1 075.0
Total	9 479.8	7 299.8	2 770.6

. . Not applicable.

Sources: ABS (1986), Australian Institute of Petroleum Ltd (1986), Commonwealth of Australia (1986-87), BTCE estimates.

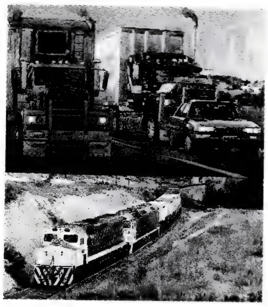
Table reprinted with permission from BTCE Occasional paper No. 90.

TABLE 3

Total road expenditure by all governments, 1984/85
($ MILLION)

	NSW	VIC	QLD	SA	WA	TAS	NT	ACT	TOTAL
Construction	898.1	485.1	486.9	157.8	248.9	107.8	46.9	17.1	2448.60
Maintenance	422.3	266.1	252.3	106.3	97.4	40.2	20.0	11.0	1215.60
Planning & Research									16.20
TOTAL									3680.40

Source: Australian Road Financing Statistics 1975/76 to 1984/85, Federal Bureau of Transport Economics, 1988.



What are the "external costs" of road transport and are they worth worrying about?

EXTERNAL costs include the costs of road trauma, deferred maintenance, congestion and delays imposed by vehicles upon one another, noise (particularly of trucks going through country towns late at night), and air pollution.

Many participants in the debate conveniently ignore these external costs for two reasons.

Firstly, it is hard to put a dollar value on them.

Secondly, the costs are not borne by a single authority or firm but by millions of people all over Australia.

The Australian governments on the other hand can't ignore these costs just because it is convenient to do so. Government research has used economic theory to account for these costs. They are large, and governments could be misled if they were ignored.

Road Trauma. In 1985, costs of road trauma in Australia were estimated by the Bureau of Transport and Communications Economics at $5 billion – a staggering 160 per cent of the amount spent by authorities on road construction and maintenance.

Heavy trucks represent less than 8 per cent of all registrations, but at least 10 per cent of road traumas costs are attributable to them.

On a tonne-km basis, road freight transport causes 18 times more deaths than rail. The death rate per tonne-km by road increases for the heavier trucks.

Air and Noise Pollution. Although pollution is one of the most difficult things to quantify, the costs are undoubtedly real.

Air pollution affects the health of whole communities. Everyone is familiar with the black smoke spewing from the exhausts of badly-tuned diesel trucks. It also oxidises electricity infrastructure and can damage buildings and crops.

Surveys in Melbourne indicate that of the people exposed in traffic noise above the 68dB(A)L_{12}(18 hour) standard, a quarter (60,000) are highly annoyed by noise pollution. A similar problem occurs in country towns. Overseas, studies of property depreciation suggest that house values decline by about 1 per cent for every two decibel increase in trafffic noise.

Deferred Maintenance. Age and traffic levels are of particular importance in maintaining the value of our road assets. Typically, two thirds of pavement deterioration is concentrated in the final third of the design life of the pavement.

Our national highways and major rural arterial roads are all fairly new, having been refurbished during the late 1970s and the 1980s. But many rural sub-arterial and local roads are on average approaching the time when sharp increases in traffic or axle loads could bring rapid deterioration.

If there is deregulation and trucks remain under-taxed, even more farm produce will be carried on farm-to-market roads by large trucks, which will go direct to the coast, replacing the lighter "feeder" trucks now used for servicing rail silos.

This extra loading is likely to cause rapid deterioration of shire roads, forcing rural communities to spend more and more on them. The benefits of this spending will not necessarily flow back into the rural community that pays the bill.

Enforcement. The costs of enforcing overloading and other transport regulations are not included in the costs of construction and maintenance. Instead, they are paid separately by all road users — yet another cost that Australians pay to make sure that trucks do not inflict even more damage on our roads.

How can we get efficiency and equity back into the transport system?

IT is important that Australia's whole transport system operates efficiently and that all the beneficiaries of the system pay their fair share of the costs.

Put simply, efficiency means that transport services will be used according to the value customers put on them. In this sense, efficiency requires that a customer of a transport service, rail or road, should pay a price that includes the provider's extra costs of providing the service.

This means that it is important that freight prices reflect the true cost of transport. They must not be distorted by hidden subsidies such as those in the road transport sector, where trucks do not pay the full costs of the roads they use.

It should be noted here that rail transport can efficiently carry very large quantities of freight on long distances. This is because once the basic track system is in place and paid for, rail's marginal costs are very low.

Road transport is much better suited to carrying small loads short distances.

It should also be noted that, on a tonne-km basis, rail uses about one-third of the fuel energy of road transport. Given Australia's dependency on fuel imports, this is a vitally important statistic.

Clearly, it is the interests of the Australian people that the road and rail systems be used to maximum efficiency.

If trucks are taxed to achieve this, however, it does not follow that the revenue raised will be enough to meet the costs of road construction and maintenance. This is because overall efficiency calls for a balance of traffic between road, rail, air and sea. It is possible that efficient traffic distribution won't raise enough revenue.

In this case, governements might simply subsidise roads out of general taxation. But in this case the people who benefit from roads are unlikely to be those who pay the taxes.

We believe that those who benefit most from roads should pay accordingly. Government studies suggest that about two-thirds of the benefits of roads flow to commercial vehicles, including trucks, and that total benefits are in the order of $10 billion a year.

Fairness therefore demands that governments should revise the system of road taxation, so that the taxes paid by the road transport industry match the benefits it receives, thereby bringing about a suitable balance between efficiency and equity.

What should be done?

TO answer this, we must first note that the major beneficiaries of public spending on roads are not necessarily truck owner-drivers. Competition is intense both inside the road transport industry and between road and rail. We doubt if any operator is making unreasonable profits.

The real beneficiaries of subsidies to the road sector are the people who consign goods. They are *not* the community at large, but instead include importers, large manufacturing firms and some primary producers.

Although those beneficiaries in competitive industries would probably pass their savings on to consumers, industries that can control their markets need not pass the benefits on to the community.

It is important, therefore, that these beneficiaries pay what it costs to provide the transport system, including terminals, vehicles, way and external costs. These buyers of freight services must be made to understand that some kinds of transport cost more than others. It is up to them to choose the best deal. This means

THE GREAT DEBATE

that the true price of vehicles, terminals, way and external costs should be directly reflected in freight rates and not buried in overheads.

In the case of railways, these costs are internal and so are taken into account in setting freight rates.

This is not the case for road transport. The roads are paid for largely by government, and the external costs are met by the whole community.

Railways of Australia believes that we need a taxation system which forces road freight companies to pay at least the full cost of road use. This should be collected in such a way that shippers understand the true road costs per tonne-km.

The practical way to achieve this is to impose directly on trucks a weight/distance taxation system. Distance travelled should be measured by sealed devices fitted to trucks in the same way as sealed meters are fitted to taxis, and gas and electricity services.

These meters, common overseas, could be fitted to a truck for about $300 to $500.

This arrangement would not only be equitable but would also lead to a more efficient allocation of resources between road and rail because costs would have a direct impact on the price of freight services.

Why should trucks pay more and how much should they pay?

THERE are two reasons why trucks should be asked to pay a much larger contribution to the costs of road building and maintenance than they do now.

The first reason is that heavy trucks cause many times more damage than other vehicles. This is because they travel further, have more axles, and have greater axle loads.

The combined effect is best illustrated by applying an "equivalent standard axle" (ESA) approach. This takes account of total load and axle grouping.

ESA score for truck	=	**2.9**	=	**906 times**
ESA score for car	=	**.0032**		
Distance travelled by truck	=	**150,000km**	=	**7.5 times**
Distance travelled by car	=	**20,000km**		
Total	=	**906 × 7.5**	=	**6800 times**

The following calculation compares a 41-tonne truck fully laden for 60 per cent of its annual kilometrage of 150,000 km with a fully laden private car travelling 20,000 km a year.

HOW MANY HEAVY TRUCKS WOULD IT TAKE TO CARRY THIS STATE RAIL FREIGHTER'S CARGO? APART FROM THE COSTS OF ROADS, THE EXTERNAL COSTS OF ROAD HAULAGE MUST BE MET BY THE WHOLE COMMUNITY.

In other words, in any year the average six-axle truck causes nearly 7,000 times as much damage as an ordinary private car.

Does the truck pay 7,000 times as much for its registration fee? No. Its registration fee is only between 20 and 30 times that of the car.

The second reason for asking trucks to pay more is that they receive a disproportionally large share of the benefits of road expenditure, in relation to the amount they pay.

Some idea of the benefits enjoyed by trucks can be gained by considering studies done by bodies such as the Bureau of Transport and Communications Economics. Over the past 20 years, these studies have consistently found that commercial vehicles receive about 60 per cent of the benefits of new road investment.

The same studies show that no government has ever allocated funds to roads unless, on average, the benefit obtained is more than three times the investment.

This suggests that the money Australia spends on roads is a very good investment indeed. The total benefits are at least $10 to $12 billion a year. But the lion's share of these benefits is going to one small group – the road transport industry.

Under-recovery of road costs has been going on for years. In 1984/85, road costs were estimated at $18,000 per six-axle truck per year. Now it could be as high as $50,000 a year, the estimates of the BTCE's most recent research paper on the topic (Occasional Paper No. 90 by Luck & Martin).

The third reason for getting trucks to pay their way is that only about $1.7 billion of the $3.7 billion spent on roads each year is raised directly from road users through registration fees and other direct charges.

The road transport lobby argues that the $2 billion supplement coming from general taxation should be greatly increased. But they don't say which hospitals would suffer, which schools would be disadvantaged, and who would go without a fair trial so that their unfair advantage could be enhanced.

The road transport lobby also argues that laws should be passed to earmark this indirect taxation for roads. In other words, they want their subsidies enshrined in legislation. But there is something they aren't saying. Legislation of this kind may be unconstitutional.

Railways of Australia believes that governments are elected by the citizens to decide on the allocation of funds between roads and other essentials. If road users want any further upgrading of the roads network, it is only fair that their charges should be substantially increased so that others don't have to pay the cost.

The fourth reason for increasing trucks' contributions is that the improved productivity the road industry enjoys is to a large extent due to the benefits it receives from government spending on roads.

These benefits have included load limits, higher speed limits, and longer driving hours.

In spite of this the road transport industry keeps pushing for higher and higher productivity benefits by way of increased spending on roads. For example, it is now seeking approval for widespread use of B-trains, which need a divided road system for their optimal use. These juggernauts have a gross vehicle mass of 60-70 tonnes – *over 50 per cent more than a six-axle semi-trailer.*

Surely it is only fair that the road transport industry pays proportionately for all the benefits it receives from the road system?

New taxes on road trucks should be imposed before any more B-trains are approved.

The Railways of Australia believe that the details of such a system require further consideration by government. As a guide, it appears that a tax of about 1 per cent tonne kilometre should be imposed on all consignments of road freight in Australia.

A tax like this would cover the costs of road damage, be in proportion to the benefits received by road freight, and add less than half a per cent to the road transport costs of industry. Much if not all of the cost to industry could be saved by switching to rail.

Most importantly of all, as a result of this tax consignors would choose the most efficient method of transport. This could only benefit all Australians.

AUSTRALIAN NATIONAL IN PURSUIT OF EXCELLENT SERVICE

The second of Network's series by the chief executives of Australia's rail systems is written by Russell King of Australian National.

I have taken the opportunity in this article to describe some important ambitions being pursued by Australian National which will have an impact on other rail systems. Some people may feel uncomfortable with what I have to say. But my concern is to give momentum to changes which will enable this country's national rail system to attract a larger share of the national freight task, an achievement which will benefit all Australians.

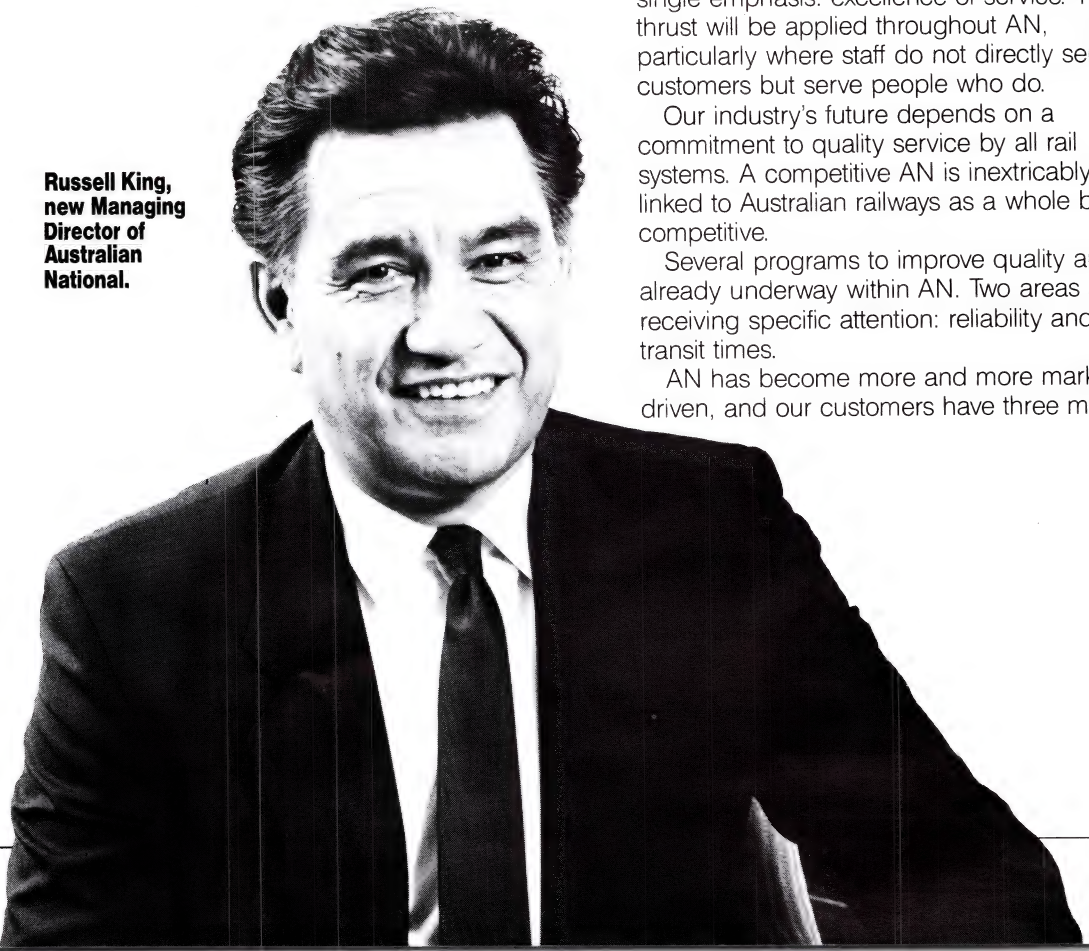
The goal that has been the focus of AN's efforts for the past decade – break-even on our commercial business by 1988 – is now behind us, and we are concentrating on the path ahead.

The new direction now emerging has a single emphasis: excellence of service. This thrust will be applied throughout AN, particularly where staff do not directly serve customers but serve people who do.

Our industry's future depends on a commitment to quality service by all rail systems. A competitive AN is inextricably linked to Australian railways as a whole being competitive.

Several programs to improve quality are already underway within AN. Two areas are receiving specific attention: reliability and transit times.

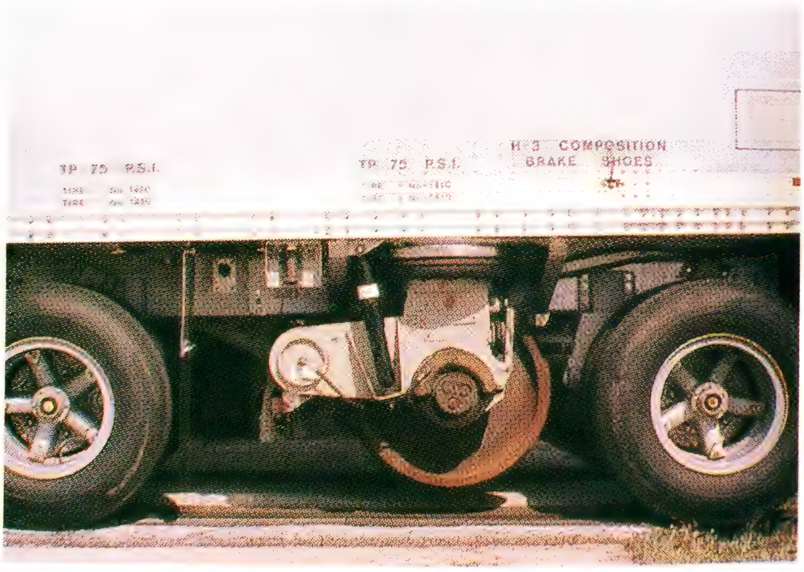
AN has become more and more market-driven, and our customers have three main



Russell King, new Managing Director of Australian National.

Opposite page: The RoadRailer semi-trailer transfers directly to rail with no lifting for inter-capital city linehauls.

One of the RoadRailer's many advantages is the superior quality of its ride, almost eliminating damage to goods.



requirements. They are, in order of priority:

- A consistent service, which means predictable, on-time rail services.
- A fast and reliable service.
- Competitive prices.

Transit times and reliability are being improved through locomotive, rollingstock and track initiatives.

Our ageing locomotive fleet is being replaced with new DLs and ELs.

More efficient new wagons are being produced. Older wagons are being modified to run at greater speeds by the installation of constant contact sidebearers and hydraulic stabilisers in bogies. Faster running speeds are an important by-product of general wagon modification to suit customer's needs and to carry greater payloads.

Track improvements include concrete re-sleepering, railgrinding, and continuous rail welding – all aimed at improving transit times.

As most of the freight AN carries comes from or goes to destinations in other rail systems, it is essential that speed and reliability be achieved across complete intersystem corridors.

Not just by a nose: our most fuel-

Actual on-the-track fuel-efficiency tests were recently conducted on a major U.S. railroad, using the GM SD60 equivalent of a Clyde Super Series Locomotive. It was pitted against their major competitor.

Unlike some earlier fuel-efficiency tests, these were conducted in the real world, on hills and curves and with starting, stopping and under simulated load conditions.

A lot of people expected the Super Series to come in second. After all, General Motors didn't become the world's number one maker of locomotives because of fuel-efficiency alone.

They became number one because their locomotives are reliable, tough and easy to maintain. And because of the speedy reliability of parts and service.

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PROM. 10/42

WE NEED TO FORM A UNITED FRONT AGAINST OUR COMPETITION, AND TO OFFER A UNIFORM LEVEL OF SERVICE. IF THIS IS ACHIEVED, WE WILL ALL MOVE AHEAD.

Here at AN we are the first to admit that we still have many problems to solve so that we can meet our reliability and transit objectives. But we are determined to remove the obstacles that hinder the achievement of these goals.

What Australia needs is single control over the terminals where rail freight originates and terminates, the track in between, and the train itself.

Efficient and reliable freight services will ultimately be of benefit to all of us in the race for market share against road transport and the search for new market opportunities.

The national rail system will have a real sustainable competitive advantage when RoadRailers begin operating. AN has acquired the exclusive Australian licence to manufacture and market RoadRailer, a road transport semi-trailer that will transfer directly to rail with no lifting for the inter-capital city linehauls.

RoadRailers will be aimed initially at general consolidated freight requiring overnight service (Adelaide-Melbourne, Adelaide-Sydney, Sydney-Melbourne, Sydney-Brisbane and Adelaide-Perth). We will aim for freight not carried by rail, and we will ensure that this service brings in new freight customers and does not divert existing rail traffic.

To ensure that RoadRailer is a success, a number of key issues need resolving.

- We must provide a range of efficient and consistently reliable services tailored to suit customers' needs.
- Transit times must be competitive with road transit times. RoadRailer will have to have priority path scheduling between capital cities if we are to achieve this.
- RoadRailer must compete with road on linehaul, transit time and rate structures.

One of RoadRailer's many advantages is the superior quality of its ride. It is better than any rail equipment and better than most road transport. Damage to goods will be almost eliminated.

The licensing agreement for RoadRailer requires that AN maintain effective and total control of the national operation and marketing of RoadRailer services in Australia. This breaks new ground and will set precedents for rail activity in Australia.

As RoadRailer is quite new to Australia, we have an opportunity to take a fresh approach to all aspects of the operation. Our methods must be established from the ground up.

For too long moves by individual rail systems towards more efficient and cost-effective operations have been hampered by historical constraints. Operating RoadRailer on a parochial system-to-system basis might keep everyone happy, but RoadRailer, and therefore AN and other rail systems, would suffer in the long-term because our customers' need to have effective management of such a service would be ignored.

We believe it is desirable for AN locomotives to provide motive power on a national basis, with crewing arrangements to be shared with other systems. Detailed schedules and right-of-way costs will require negotiation. Dedicated sidings in all states are essential.

Establishing the RoadRailer operation using AN trains operating to and from suitable dedicated sidings in Adelaide, Sydney and Melbourne would be an ideal small-scale test for many of the complex arrangements that will be needed when a single organisation is given responsibility for intersystem freight.

This must happen if rail is to survive in the increasingly competitive freight market within Australia. We need to form a united front against our competition, and to offer a uniform level of service. If this is achieved, we will all move ahead.

If we fail to achieve this, then in the long-term our future – and by that I mean the future of all Australian railway systems, including AN – will be bleak.

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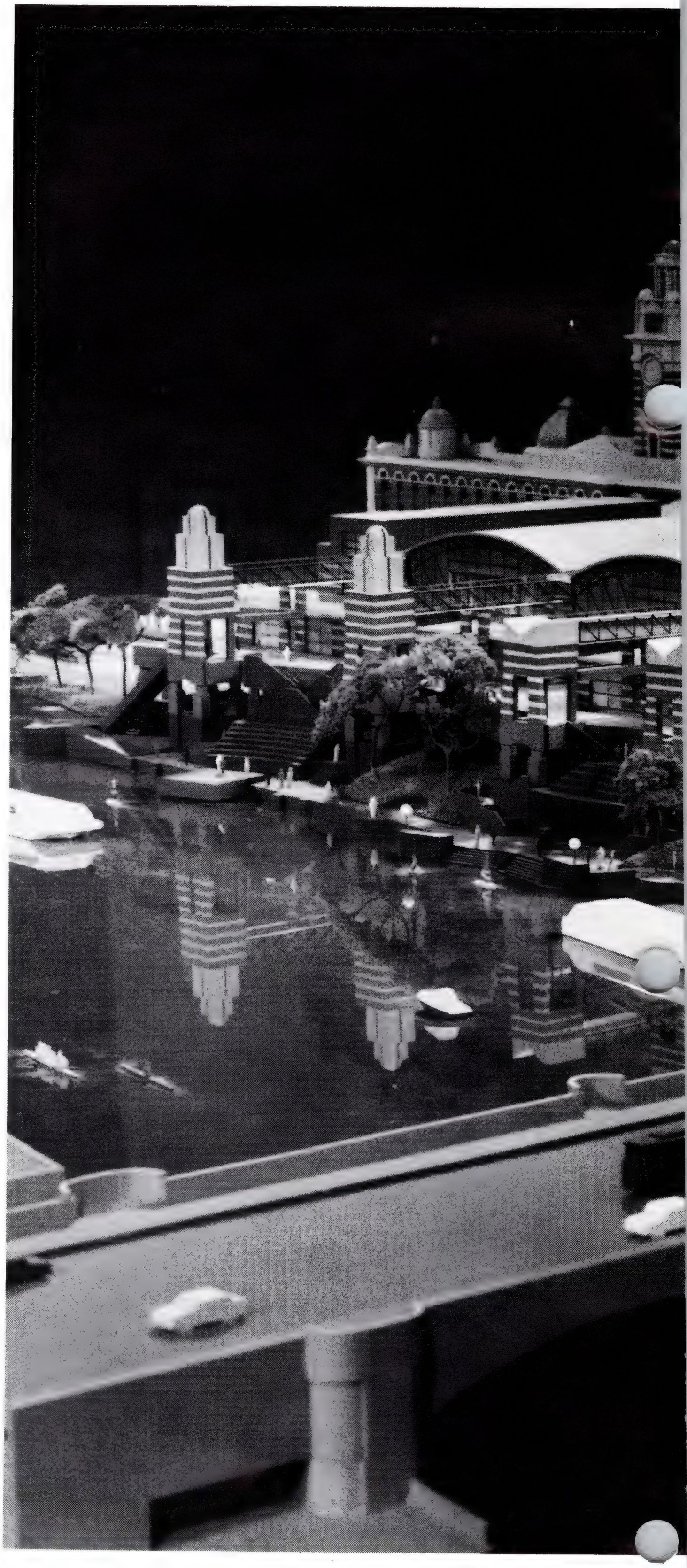


Flinders Street Station in Melbourne is to be redeveloped at a cost of $250 million to incorporate restaurants on the Yarra River, terrace cafes, food outlets and more than 100 specialty shops.

The Flinders Street Station project, to be developed by the Merlin/Hooker consortium, will be called the Festival Marketplace and hopes to emulate the atmosphere of public places like Milan's La Galleria and London's Covent Garden.

"The Festival Marketplace will inject new life into a grand emblem of Melbourne," said Mr Ian Hayson, managing director of Merlin International Properties.

"Flinders Street Station is part of Melbourne's social history as a meeting place. This project will expand this fine building's meaning and purpose for the people of the city, and at the same time improve it as a commuter facility."

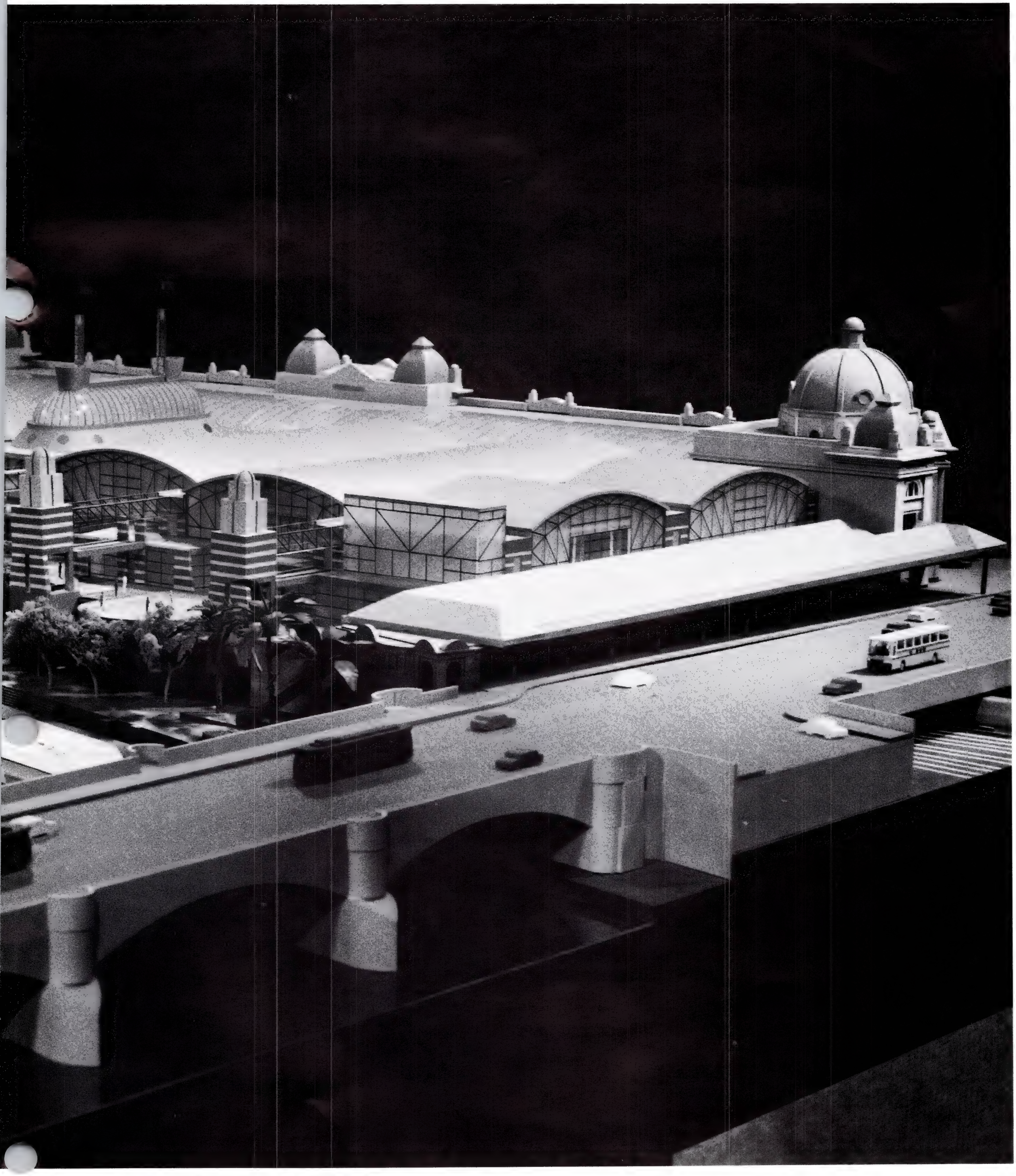
Daryl Jackson, one of Australia's leading architects, will head the design team of the Festival Marketplace. The Jackson design of a series of shallow-curve roof lines was inspired by the original and unfinished Fawcett/Ashworth's 19th century plans for Flinders Street Station. These called for a series of low-vaulted roofs to create a grand covered space. Jackson will realise the dreams of a century ago.

The new Festival Marketplace will consist of four grand halls. Full height glass walls at the southern end will provide views over the Yarra and Arts Centre complex. A concrete deck, level with Swanston Street, will extend across the railway tracks and platforms, creating a base for two levels above. The low-rise new building does not alter the skyline.

Flinders Street Station itself will be restored in accordance with the requirements of Historic Buildings Committee at the developers' expense.

Work on the project will start this year, with a planned opening in late 1991.

W SEAT



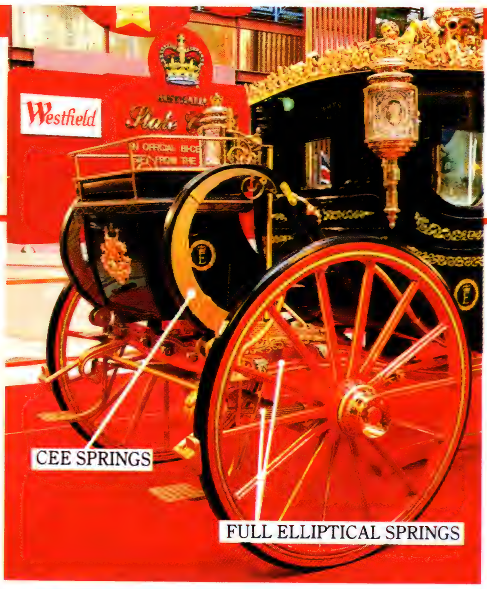
Model of the redeveloped Flinders Street Station in Melbourne shows its new exposure to the Yarra River.

Spring Makers

FOR THE STATE COACH

Lovells Springs were chosen to produce the beautiful cee springs and the full elliptical springs used to suspend the magnificent State Coach. Lovells Springs are one of the few springs companies in the world capable of producing these springs, which are a work of art.

LOVELLS SPRINGS



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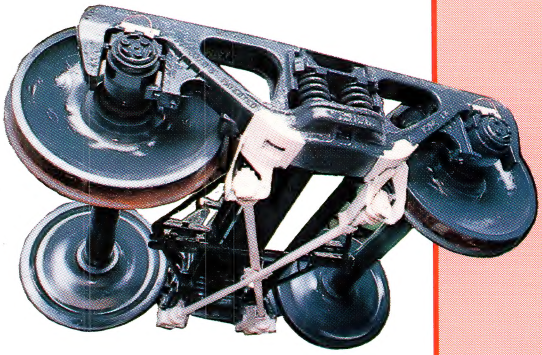

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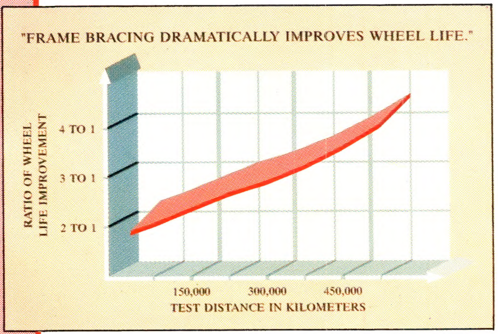

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BHP'S NEW 32KM LINE

A new 32km "tramway" – actually a heavy duty narrow-gauge railway – is being built by BHP near Whyalla in South Australia.

A major extension to BHP's Whyalla-Iron Baron track, it is the first private line to be built in South Australia since the mid-1960s.

The new line is needed because the iron ore reserves at the Iron Baron open-cut iron ore mine have run out. To maintain supplies to its steel plant in Whyalla, BHP's Long Products Division is spending $50 million to develop another iron ore source – three separate deposits at Iron Duke, Iron Duchess and Iron Knight – in the nearby South Middleback.

The project calls for the development of the mine site, stockpiles, crushing, blending and loading plant, and power, water, rail and road services. The Baulderstone Hornibrook Group with Kinhill Engineers are developing the mine in such a way that BHP can transfer operations from Iron Baron to Iron Duke almost overnight.

The new line will be a fully-welded track of 51kg rail fixed by Trak-Lok to steel sleepers and bedded in crushed-slag ballast.

Maximum gradient on the line, which passes through undulating, semi-arid country, is 1 in 90 against empty trains and 1 in 200 against loaded trains. The tramway earthworks formation is being built of material selected from required cuts and local borrow areas and will have a total fill volume of 350,000 cubic metres.

To handle the expected annual load two million tonnes, two trains, each carrying 3,000 tonnes of ore, will be run daily. Each will comprise 50-bogie ore wagons hauled by twin 960 kW diesel electric locomotives, all from the existing BHP fleet. Trains will complete one round trip (130km) in an eight-hour shift.

Loading will be from overhead bins fed by conveyor from ore stockpiles. The 10 bins can hold 3,000 tonnes and load five rail wagons at a time, with gates controlling the ore flow. A whole train will take 45-60 minutes to fill.

Tracklaying is due to begin in August and finish by December 1989, going into service with the ore handling plant in February 1990.

THAI SIGNAL CONTRACT

Westinghouse Brake & Signal Company (Australia) Ltd, a Hawker Siddeley company, has signed a $A73 million contract to supply a signalling system to the State Railway of Thailand.

The signalling system will modernise the 150km network between Bangkok and Lop Buri and Taling Chan Junction, including the major junctions to the north, south and north-east of Bangkok.

A Westinghouse computer-based centralised traffic control system and a computer-based communications system (including fibre optic cable and communication links) will be used by operators at Bang Sue and headquarters management to provide a continuous overview of the network, including the position, identity and type of rolling stock. Timetable information and on-time running data of all trains in the area will also be provided.

Westinghouse staff will supervise the installation, and State Railway of Thailand engineers will be thoroughly trained in Australia to maintain the sophisticated equipment. The Australian Government has provided funding for the project, using a mixture of concessional finance and grant aid. The flexibility of the package helped Westinghouse win the contract.

At the signing of the contract ceremony in Bangkok, (above) were (from left): Mr Chookoi Sawamonnas (chief of legal department), Mr Thavorn Ratanavahara (chief of signal and communications bureau), Mr Chird Boonyaratave (general manager), of the State Railway of Thailand, and Mr Trevor Perry (regional manager Asia), Mr Dave Allen (managing director, Westinghouse Australia), and Mr Ken Laughlin (manager of special projects).

ELECTRIFYING

The first international conference on main-line railway electrification will be held at the University of York from 25-28 September 1989.

More than 80 papers from 15 countries will be presented during the three-day conference. The opening address by Sir Robert Reid, chairman of the British Railways Board, will be followed by sessions discussing the economic, project and technical aspects of British Railways' east coast main line electrification, French Railways' TGV trains and high-speed lines, and German Railways' high-speed train and high-speed lines.

Other sessions will cover:

- *Three-phase drive developments.*
- *Overhead, pantographs and monitoring.*
- *Data management and diagnostics.*
- *AC and DC electrification power supplies.*
- *Electrification power supply disturbances and corrections.*
- *Gate turn off (GTO) thyristors, traction transformers, air conditioning.*
- *Signalling.*
- *Development and use of computer simulations.*
- *AC and DC traction units.*

The conference will also include a program of technical visits on Thursday, 28 September.

For details contact: Conferences Services, IEE, Savoy Place, London WC2R OBL, telephone 01-240 1871, ext 222.

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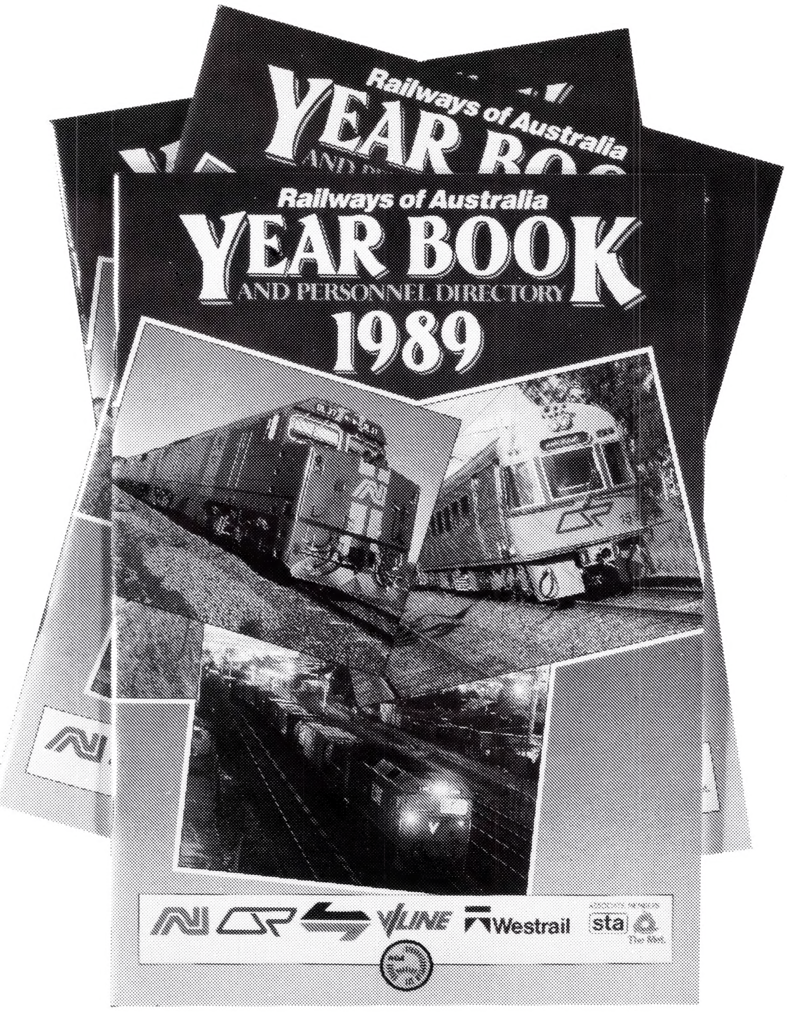

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